MARCH 1983
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COMPUTER & VIDEO GAMES



Dr Who Adventure
Pool

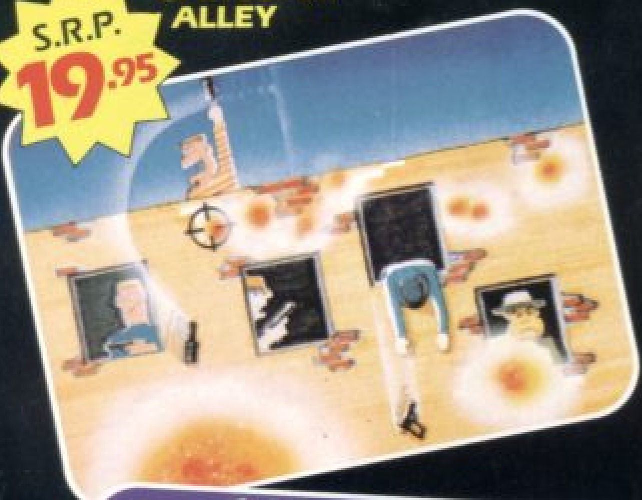
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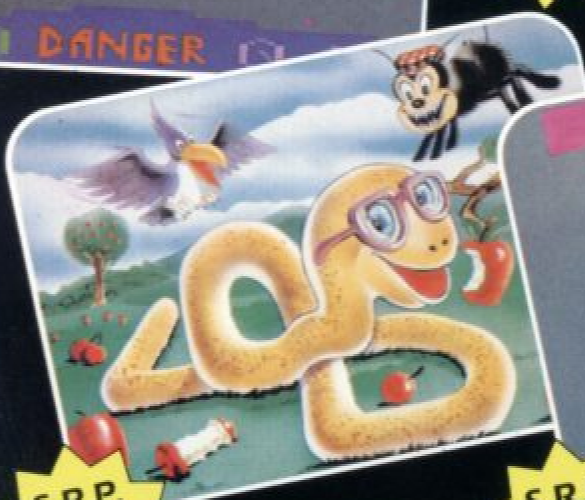


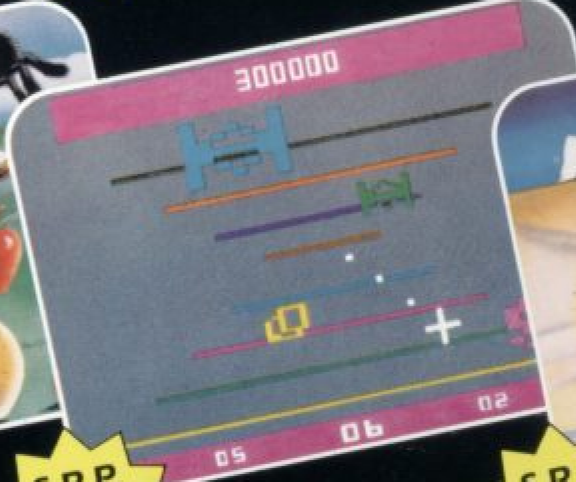




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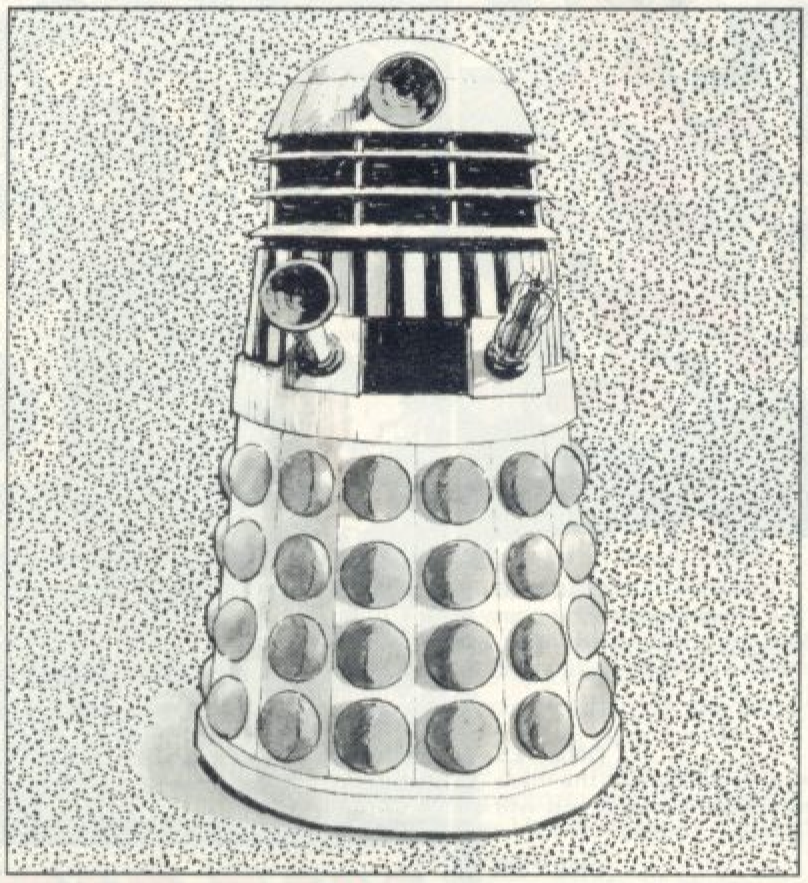
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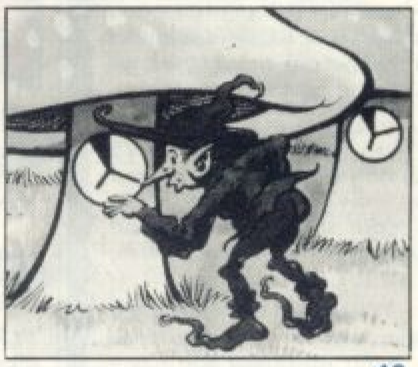
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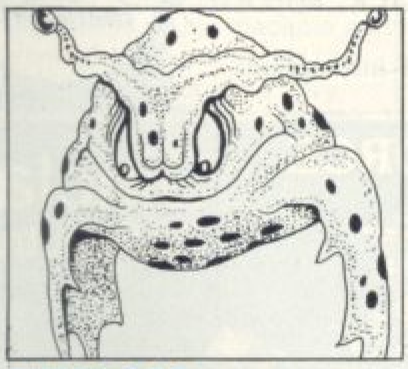
MARCH 1983 Vol II. No 4

News & Reviews

Listings









Empire news...

Calling all you space tribe commanders: the galactic messengers are reporting on the results of the first interstellar conflicts on page 23.

There is also word on the richest planetary systems over the last parsec and the latest on empire upheavals and the current peace treaties and warfare.

If you have proved an able commander of space fleets then you may be in our top 10 profit-makers. We also announce the overall champion of our first Seventh Empire conflict.

An entry form for the next April issue turn of Seventh Empire is on page 11 and we announce our overall prize for the top Seventh Empire scorer for the first six months on page 22.

Our Book of Reviews may already have tried to fall out of this issue. But if it's still to be found in the centre pages, you'll find news of over 70 professional software tapes, tried, tested and marked.

Features

Editor Terry Pratt, **Staff Writer** Eugene Lacey, **Editorial/Publishing Asst.** Susan Cameron, **Designer** Linda Freeman, **Production editor** Tim Metcalfe,

Advertisement manager Rita Lewis, **Advertising executives** John Phillips, Louise Matthews **Advertisement assistant** Louise Flockhart, **Publisher** Tom Moloney

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Cover: Stephen Gulbis. **Next issue: March 16th**

missile panic



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VISA



Please drop us a line at: Computer and Video Games, EMAP, Durrant House, 8 Herbal Hill, London EC1R 5JB.

SPECTRUM DEBATE . . .

Dear Sir,
I would like to make my own comments on the so-called BBC versus Spectrum conflict.

Many people believe that the Spectrum is the greatest computer ever made, in the same way that they thought the ZX81 was a year ago.

In fact the Spectrum is only one of many computers with features that are today regarded as standard.

However, the ZX Spectrum has one advantage over all the rest — its price. It is a cheap computer. A "Jack of all trades" and master of none.

Inevitably Sinclair's machine will become the most popular, greatly aided by his adverts that leave the readers with both a good impression of his machine and a bad impression of the rest.

The BBC micro is a very powerful machine, no matter how much Sinclair and his fans will degrade it. If it was anything less, it would not have been chosen as the BBC's micro.

Also, the designers of Acorn have taken great care to make sure their machine is not outdated in the future, and as a long term investment this machine is real value for money.

David McKeran,
Sunderland,
Tyne and Wear.

. . . GOES ON AND ON . . .

Dear Sir,
I am writing to you referring to the letter that a Mr. McAuley wrote in your December issue. As far as I can see anyone must be stupid at turning down an offer for a BBC Model A, even when a Sinclair Spectrum with all its extras is offered as an alternative.

For just £60 extra the Model A can become a Model B and many more peripherals are instantly available.

The Tube allows another processor to be added and so at least doubles processing speeds. Even without the second procesor the BBC is the 3rd fastest machine according to bench tests.

Delivery has been stepped up immensely. A friend of mine ordered one only a week ago and it arrived yesterday. I bet Sinclair can't say that about his Spectrum or indeed any of his computers. My conclusion is that the BBC computer will still be in great demand by the year 2900.

As for the Spectrum I expect that will be replaced by the ZX83 next year.

If this letter were to be published I am sure it would give people something to think about.

Tim Place,
Thornborough,
Buckinghamshire.

I KNOW WHAT IS BEST!

Dear Sir,
Truly a remarkable breakthrough in computer magazines. I find your magazine fun to read and very entertaining, especially the software reviews. Is the BBC Defender the only game to get 10/10 for playability?

I write to you concerning the letter sent in by Mr Alan McAuley (December 1982) degrading the model A BBC.

As far as I am concerned the Spectrum cannot match the BBC in any respect. It is the quality of the Beeb that puts it above the competitors.

Mr S. S. Alg,
Fulham,
London.

PRINTER WITH A PROBLEM

Dear Sir,
Having read in many mags that uncle Clive's production is now on schedule, has compelled me to put a finger or two to keyboard.

It was last August, the 1st actually, best date for my credit cards, that I ordered my Spectrum 48K. It arrived on the 11th November — less the printer.

After a couple of phone calls it arrived about a week later. I'll be able to list some of my programmes I thought. Well, it listed 10 lines and stopped.

So I sent the lot back. I received a letter asking me what I wanted them to do with the printer. Please return everything in working order I replied.

That was on the 26th November 1982, and I am still waiting.

I can quite understand why Clive has a production problem, obviously repairing more units than he is making.

Kenneth C. Alford,
Sheerness,
Kent.

COLOUR CODE FOR BBC

Dear Sir,
Congratulations on an excellent magazine.

I find the reviews of software a great help in deciding what to spend my money on. I am particularly looking forward to your "Seventh Empire" competition which I have entered.

I totally agree with M. D. Caballero's remarks about the ZX Spectrum leaflet, in my opinion the BBC model A and certainly the Atari 400 are miles better than the Spectrum — at least the BBC has a decent keyboard.

As for the pathetic sound on the Spectrum being compared to the three channels on the BBC and the four on the Atari I think it's ridiculous!

As you might of guessed I am a BBC owner and I wonder if you might be able to answer a question for me. Are there any Scott Adams adventure games available for the BBC B?

You may also be interested to know that when using mode 2 graphics on the BBC B it is possible to get 255 different shades of colours. The short program below will illustrate this.

```
10 MODE 2
20 GCOL RND(30), RND(255)
30 PLOT
85,RND(1280),RND(1024)
40 GOTO 10
```

The method only works if you have a number over about 20 in the first half of the GCOL statement.

Alan Winnett,
Beccles,
Suffolk.

Editor's reply: Sorry Alan, I'm afraid that as yet none of Scott Adams popular Adventures are available for the BBC micro.





MAILBAG



IAN FINDS A FRIEND

Dear Sir,
With reference to your Mailbag column in the January issue, and the request by Ian Bailey of Streatham, London. I am in the position to be of assistance to him as I own a TRS80 16K level II machine and line printer III.

If he wishes to forward the tapes of the programs to me I will list them for him and return them along with the listings.

W. I. Temple,
Glasgow.

Editor's reply: There you are Ian, *C&VG* readers are a useful bunch to know!

BOMBER BACK ON TARGET

Dear Sir,
With reference to *Confessions of a Bug,* October 1982, I have the reason why so many people enquired about the errors in the Atari Bomber program printed in September.

Apparently, the program was written on a 400 which probably had only 16K or RAM. Bomber works perfectly for 16K machines, but problems arise when the memory is expanded.

This is because screen RAM is located right at the top of memory and will therefore change when memory changes.

In the program, all screen POKE locations are those for a 16K machine. I have a 32K 800 and the program would not work for me. When I removed one of the 16K RAM packs, it worked perfectly. I therefore give amendments to the program, to allow the program to be run on non-16K machines.

Change: 10 GRAPHICS 1+16: B=15965 to: 10 GRAPHICS 1+16: RAM=PEEK (741)+256*PEEK (742)+33: B=RAM+221

The variable RAM now holds the address of the top left-hand corner of the screen.

Now change, in the program, any occurrence of the addresses below to the expression on the right.

15983=RAM+239
15943=RAM+199
15923=RAM+179
16003=RAM+2549
15965=RAM+221
15745=RAM+1
16205=RAM+461
15764=RAM+20
16183=RAM+439

Christopher Simon,
Clwyd,
North Wales.

SHIFTING MEMORIES

Dear Sir,
I am the satisfied owner of a Commodore Vic-20, but after having it for some months I feel the need to expand it. However this is causing me some concern as I have read that when memory cartridges are plugged into the Vic the memory shifts. Not only does it just shift when cartridges are inserted, but it just shifts differently when you have 5K, 8K or above 8K.

Does this mean that programs written for the unexpanded machine will not run on an expanded machine because of the shift? And also programmes that need an expansion of 8K will not run on a machine with a 16K pack even though there is plenty of memory?

Jonathan Phillips,
Lydney,
Gloucestershire.

Editor's reply: The answer to your first question is not without some programming. In answer to your second question — it would depend on the memory expansion board.

SORTING OUT THE BUGS

Dear Sir,
I have found another bug in the ZX81 manual: Appendix A, the character set, starts:- "The ZX80 character . . ."

Is Uncle Clive pulling a fast one, or is it yet another bug?

Andrew Park,
Darlington,
Co. Durham.



QUESTIONS FOR VIC

Dear Sir,
As a reader from the first issue of your great magazine I decided it was time to write to you with a question! Is it possible to connect my VIC-20 to Cefax or any other service? If so, how much?

Neal Kovac,
Ruddington,
Nottingham.

Editor's reply: It is possible to connect most microcomputers to the Prestel viewdata service of British Telecom. It is not really feasible to use one of the Cefax/Oracle teletext service of BBC/ITA.

The Vic-20, unfortunately, is not the easiest system to interface for Prestel, as it only has 22 columns of the screen whereas Prestel needs 40. B & B computers of Bolton did manufacture a 40-column adapter which could interface with Prestel — unfortunately Beelines, their supplier, has just gone bust. If you contact them though, they may still have some in stock.

SWITCH TO STATESIDE

Dear Sir,
My son has outgrown his Sinclair ZX81 and is looking for another model.

As we may be moving to the States in the next couple of years, are there any computers, besides the Atom, which are dual voltage and compatible with U.S. TV? He is somewhat interested in the BBC micro, but we suspect it is not dual voltage.

I might add that my son enjoys hours of pleasure with your magazine. No longer is he a TV addict — he's now a computer addict!

J. Mansfield,
Clayton,
Newcastle.

Editor's reply: The U.S.A. and Europe use totally different TV systems. The problem of voltage is easily overcome with a transformer. Unfortunately there is also a difference in mains frequency, 60Hz in U.S.A., 50Hz in Europe. Only a mains frequency converter will overcome this, and their cost is around £100+.

It is possible to bring U.S. equipment to the U.K., and vice-versa if a transformer/frequency converter is used.

You will need to use a multiple standard TV set/monitor though. These have both the European PAL colour TV standard and the U.S./Japanese NTSC standard on them. Again they are expensive and will cost about £500/£600. Most radio/TV shops in London sell them and they are easy to get hold of.

So, count on spending near £1,000 to enable you to move across the Atlantic. It may be cheaper to buy the appropriate system when you arrive!

MISLEADING ADVENTURES?

Dear Sir,
I have recently purchased a BBC model B micro and several commercial games. Some of these games are excellent, Micro Power in particular. However, there are a lot of very boring games advertised that I consider are misrepresented.

One Adventure game says "what next?" interminably and another "what shall I do now?" until you feel like throwing something at the set. There are some very good Adventure games, with humour but a lot are "user hostile", especially the "Ha, Ha you are dead" type.

My chief reason for writing however is the misrepresentation in advertisements as to whether games have graphics and sound. Many imply this but are only word games. They should clearly state that there are no graphics.

Even this is no guarantee as I have just returned a taped game to one of your larger advertisers asking for a refund for although the advert clearly states that the game has sound and graphics, but it does not.

Allan H. Miles,
Exeter,
Devon.


Chromasonic Hall of Fame No 10
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TWO PINBALL WINNERS

The Bally pinball competition which we set in our September issue has two winners not one.

All the entries were despatched to the US where Bally's team of top pinballs and video game designers set about judging your entries and thoroughly enjoyed the job too.

The entries were separated into the video game and pinball categories and such was the depth of imagination and careful thought which you had put into your ideas, that it took them far longer than they had thought to come up with a winner.

The result: a winner of each section and several highly commendeds too. Our Pinball winner was Andrew Muir from Grove Road, Norwich with his game Alcatraz who wins a Bally pinball machine to take home and set up in his living room.

Our most imaginative video game designer was 13-year-old Ian Boffin of Lych Way, Hansell, Woking, with his shark game Jaws. For Ian Bally have put up an extra prize of an Intellivision TV games centre.

Congratulations to these two and C&VG will also be finding something for the entries which came second and third in each category too. Full details of the winning entries will appear next month.

EMPIRES BECKON

If you have already entered our Seventh Empire game, you do not need to re-enter we will include you as soon as possible. But if you are new to *C&VG* and would like to enter fill in the form below and we will send you a rulebook and fleet starting positions for our next issue.

Please include me in the Seventh Empire game for April.

I would like to name my tribe the ......

....

My name is: ....

....

Address: ....

....

....

....

Tel: ....

PUZZLING SOLUTIONS

For those of you still struggling with the Puzzling problems on page 80, the answers are presented here. But please try them first, either in your head or by using a computer program.

Noah's problem with the ark of confused animals can be just as confusing for humans. In order of the first half the specimens are: Amoeba, Canary, Ferret, Iguana, Locust, Magpie, Oyster, Parrot, Shrimp, Spider, Turkey and a Weasel.

The solution to On the Cards is that Dan took the card with "Vixen" written on it and Bob wrote "Surly".

Turning the digits in our symbol sum into figures gives the following piece of arithmetic:

```
  598
  507
 8047
 ----
 9152
```

And the correct solution to the Cross number problem is printed right:

1	2	1		4	9	1	3
3	5	7	9	1	1		4
	6	1			2	4	
6		9	8	7		9	1
9	7		9	6	1		6
4	9	5	0		4	8	8
2	3	5		1	3	3	1

The Blooming Problem has been left in your capable hands until next month, by which time 10 of you should be the proud owners of a Vulcan Electronics Hungarian Ring to puzzle over. Send your entries in by March 12 please.

Finally, congratulations to the winners of our Space Attack problem set in January's Puzzling. A Ripper of Ormskirk, Lancs; E Marten of Southall in Middlesex and G Holden of West Ealing, London; have all won a Computer Games' Galaxy Invader 1000.

Commiserations to the losers some of whom bounced wrongly or made other illegal moves. The best score was published last month. And thanks for the Gaudy Monster entries. No prizes here but top scorer was Joan Lockett of Shrewsbury with 559.

A BUG CONFESSES ALL . . .

They should have known better than to try and sneak a book of games past us.

We slipped Snag Jnr. in there at the last moment to cause a bit of havoc with Red Alert on the Vic-20. It does not need the 16K of memory suggested in the write up and runs on a normal 3.5K machine.

Several people couldn't get their Red Alert plane to fire missiles. A complete rundown on the instructions is:

a —spacecraft goes up
; —spacecraft goes down
P —spacecraft goes left (backwards)
* —spacecraft goes forwards
Pressing shift drops the bombs
Shift and the asterisk "*"fires horizontal missiles

Those of you who called on Fruit Machine were having problems keeping the fruits in their boxes. We tracked this down to line 1. The final statement in this line reads "SR=36879".

Dodgems for the BBC Model B runs on the 1.0 operating system machine and some of the commands in this program will not run on the 0.1 machine.

Texas owners are up in arms about the Pompeii listing which became embroiled in an erupting volcano. A call or letter to the *C&VG* offices will result in the hidden part of listing being made clear.

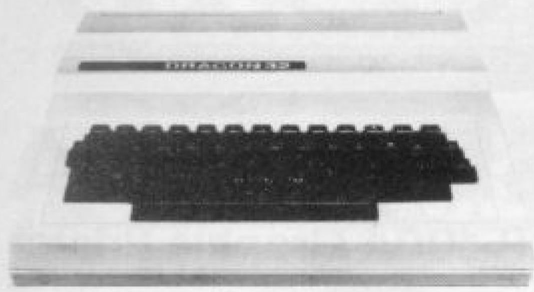
T. Hitch got to grips with Keith Campbell's Adventure page. The block and line ranges in figure one should have read: Block 1, 10-50; Block 2, 50-100; Block 3, 100-450.

Missile Command suffered from a couple of missing semi-colons but first people seemed to track these down: 210 was the offender. Each C4 in this line should be followed by a semi-colon.

The editor has asked me to apologise for the lack of a Starweb write-up this month due to a space shortage. Also out went Next Month and the promised version of Donkey Kong for the Vic-20, called Logger. This will appear in April.

HURRY! Limited stocks only-

DRAGON



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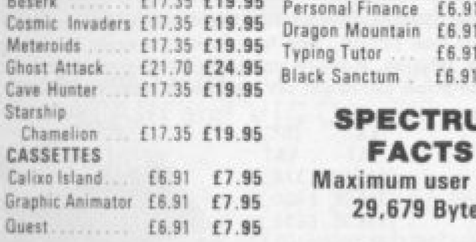
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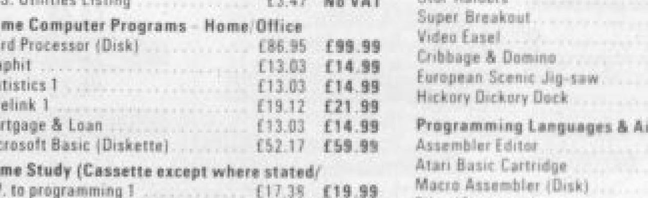
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GAMES NEWS

WATCH THE SKIES FOR DROPOUTS!

ALIEN DROPOUT

Alien Dropout sounds like a leather jacketed, drug smoking, heavy music freak from the outer reaches of the galaxy.

In fact there is nothing Bohemian about these Dropouts. They pursue a calculated scheme to colonise your planet.

The insect-like aliens swoop into ten columns at the top of the screen — building up their forces for the final attack. Once they fill a column with more than five aliens one of them swoops down — Galaxian style — and explodes on impact with the ground, throwing out deadly debris.

Armed only with a laser base your task is to shoot the aliens out of the columns before they amass sufficient numbers to swarm towards you.

The Dropouts are controlled by their leader — a giant butterfly-like alien who edges down the screen towards you when things are getting rough for his drone ships.

Alien Dropouts is based on the arcade game Zygon and is the latest addition to the Superior Software range of games for the BBC model B.

Also new from Superior is a fruit machine simulation with many of the features of the barroom favourite such as hold, nudge, and gamble.

Both games are available now from the Leeds firm at £6.50 inclusive.

Illustrations: Jon Davis





OUT FOR THE COUNT IN CASTLEMATH

CASTLEMATH

You can't count out the Mad Maths Master of Castle Math.!

This is an adventure game where you can only make progress by solving sums set for you.

Once inside the castle, a variety of creatures pop up to set more sums to be solved and at different intervals. There are also a few surprises to keep your interest.

Castlemath is the latest addition to the Audiogenic range of software for the Vic, and is designed as a fun way of improving your maths.

Also new from Audiogenic this month is a novel game entitled the Pit. You play the part of a bewildered workman who has to go from one side of the screen to the other picking up money bags — all the time dodging a deadly deluge of hail which is pouring from the sky.

Castlemath is available from the Reading-based firm at £8.95 with The Pit at £7.95.

MANOEUVRES MADE EASY IN TEXAS

WARGAME

Wargames enthusiasts can spend hours setting up the battle and positioning their troops and armaments.

Now there is a quicker way to enjoy the battle without the danger of losing any of the pieces or completely taking over the living room floor.

Everything you need to play is stored on this latest computer program for the TI99/4a.

You can play against an opponent or pit your wits against the computer.

Each time you play the computer randomly generates a map, so each game should be different. The rugged terrain is made up of woodland, hills, marshes, and open plains.

Take it in turns to move one of your six guns to a new position or lob a shell at the enemy using the joystick.

You must move all six guns in turn and the computer will tell you which one to move by making it flash.

Wargames is the latest game from TX Software of Harlow. It is available on cassette at £6 from the Essex firm.

TX's golf simulation has been bought by Thorn-EMI and will be released with their range of TI software which will be launched later this year.

THOSE LITTLE GREEN FOOTBALLERS!

ALIEN SOCCER

If you are put off taking a journey to the stars because you would miss that one precious Earthling pastime — soccer, then this latest game for the Vic reveals an encouraging discovery about aliens — they play football too.

Alien Soccer is a weird combination of some of the best elements of soccer and pinball.

You control an alien Pat Jennings who moves from right to left trying to stop the ball from crossing the goal line.

Kick the ball up screen and it will rebound around a variety of obstacles notching up points for your team.

Alien Soccer is the latest game for the unexpanded Vic-20 from Rabbit Software.

Also new from Rabbit this month are Krells and Myriad — space attack games for the unexpanded Vic.

These latest additions to the Rabbit Coinless Arcade Collection retail at £9.99 from the Harrow-based firm.

MAN-EATER GUARDS THE CHALICE

CHALICE OF KALMAR

Your only guide in the quest for the Chalice of Kalmar are the occasional flashes of lightning which illuminate your way as you follow the winding path.

If you go off the path you will be pushed back outside the temple walls.

Just to make things a little more interesting you are also being pursued by a man-eating monster.

The B-side of this cassette has a second game on it called Penguin. This is a straightforward shoot 'em down game involving a penguin.

Chalice of Kalmar and Penguin run on the TI99/4a and are available from Apex software of Brighton at £3.95.

THIS TOWN 'AINT BIG ENOUGH

HIGH NOON

It's high noon and the James gang are terrorising a sleepy western town.

Can you bring gun law to the streets of your unhappy town?

With your sherrif's badge gleaming in the bright sunlight you step bravely forward.

Who knows what may be lurking behind the shutters of the saloon, the undertakers, and the offices of the stagecoach company.

You'll need a quick finger on your trigger as the desperados appear from behind windows and walls to take pot shots at you.

But shoot straight as the good people of the town are also in hiding and a stray bullet could easily kill any one of them.

High Noon is the latest game from Abbex Software for the Sinclair Spectrum and runs in 16 or 48K.

Also new from Abbex this month is a classic Adventure entitled Austs Folley and a robot shoot-out game called Android Run.

All three games are available from the London based firm at £4.95.



CAN'T KILL A GOOD INVADER!

SPACE INVADERS

There's no getting away from Space Invaders — and a new version is due out this month for the BBC Model B.

Using Mode 5 colour graphics, these Invaders are an accurate copy of the classic arcade game and even feature an auto-play demonstration mode to attract attention when no-one is actually playing it.

Bug-Byte are also converting other arcade-proved games for the BBC micro.

City Defence recaptures the thrills of another arcade favourite, Missile Command.

In this game the skies are not filled with vapour-trails of descending missiles. A cluster of earthbound meteorites are headed down towards the cities.

The other difference is that the defence of the cities is undertaken by a steerable rocket which is launched by the player. Tactics in this game vary from the player who elects to defend all his cities to those who would rather concentrate on saving one from destruction.

Threshold is a BBC version of the popular Apple game of the same name.

Wave after wave of aliens have invaded the atmosphere and earth's defence is in your hands. The first wave trundles left-to-right across the screen with appropriate graphical and sound effects.

If you survive that one a galaxian-type wave heads down the screen towards you. There are 12 waves altogether, gradually increasing in deadliness.

All the above games run on a BBC Model B and cost approximately £8. They are available from Liverpool-based Bug-Byte.

Bug-Byte also has a Vic-20 offering due out this month. Vic Scramble is faithful to the arcade original and runs on a basic 3.5K machine for £7.

THE IDENTIKIT ALIENS ON THE RAMPAGE

GLADIATORS

A do-it-yourself alien kit is part of the magic of Galactic Gladiators.

This game of alien combat takes place in the deadly confines of a sealed off galaxy known as The Bubble.

You take the part of a leader of a troop of aliens who are your warriors. This troop is made up of identikit creatures with attributes like: strength, endurance, weapons, speed and skill.

These are given an armour-plating and weapons and sent off into combat. The stronger they are the more armour they can wear and weapons they can carry.

The game runs on an Apple II or III and comes from the U.S. company of S.S.I. under the Rapid Fire label. It is available over here from Pete & Pam Comers of Rossendale in Lancs, at a cost of £22.95.

Pete & Pam Computers also have another Rapid Fire Apple game in their warehouse at the moment. Cytron Master is set in a galaxy where all disputes are settled by robotic creations rather than human or alien life-forms.

These robotic warriors are known as Cytrons and those who pursue the life of commanding these creations are known as Cytron Masters.

At his command, a Master will have such things as: laser blasting cytrons, mine cytrons, guided missile cytrons and mobile bunker cytrons.

When two Cytron Masters are battling it out, their aim is to destroy their opponents' command centre. Only one top Cytron can survive.

The game is for two players or for one player to try and match the computer's cytron genius.

It is a fast and furious action game with three speed levels, so that beginners can learn the tactics. Cytron Master retails at £22.95.

EATING OUT DOWN AT THE SWAMP

SWAMP CHOMPERS

Swamp Chompers are not particularly attractive creations. But these mud-splattered inhabitants of the swamps of Muckedoo are your alter-egos in this new U.S. game for the Atari computers.

Between your character and its feeding station is a swamp infested with alligators and other terrifying creatures. Once you've left home, you have only 40 seconds in which to reach the feeding station and then return home.

If you make it across the swamp, jump into a flying machine to travel to your food which contains the magic ingredient to turn you into a swamp chomper, a creature capable of eating its former enemies.

The transformation lasts just nine seconds — and special bats emerge who suck the blood from swamp chompers during that time.

Ghosts also feature for extra chomping time. There are 13 different screens to build your score up, each getting more difficult.

It is available from Halesowen-based Centresoft on cassette or disc at a price of £21.95.

BEAT OFF SWARMS OF BUGS

BUG-OFF

There's a whole swarm of the nastiest creepie-crawlies all primed to ruin anybody's picnic in the new game Bug-Off.

Your character is armed only with a water gun and he must fend-off the bugs by squirting them.

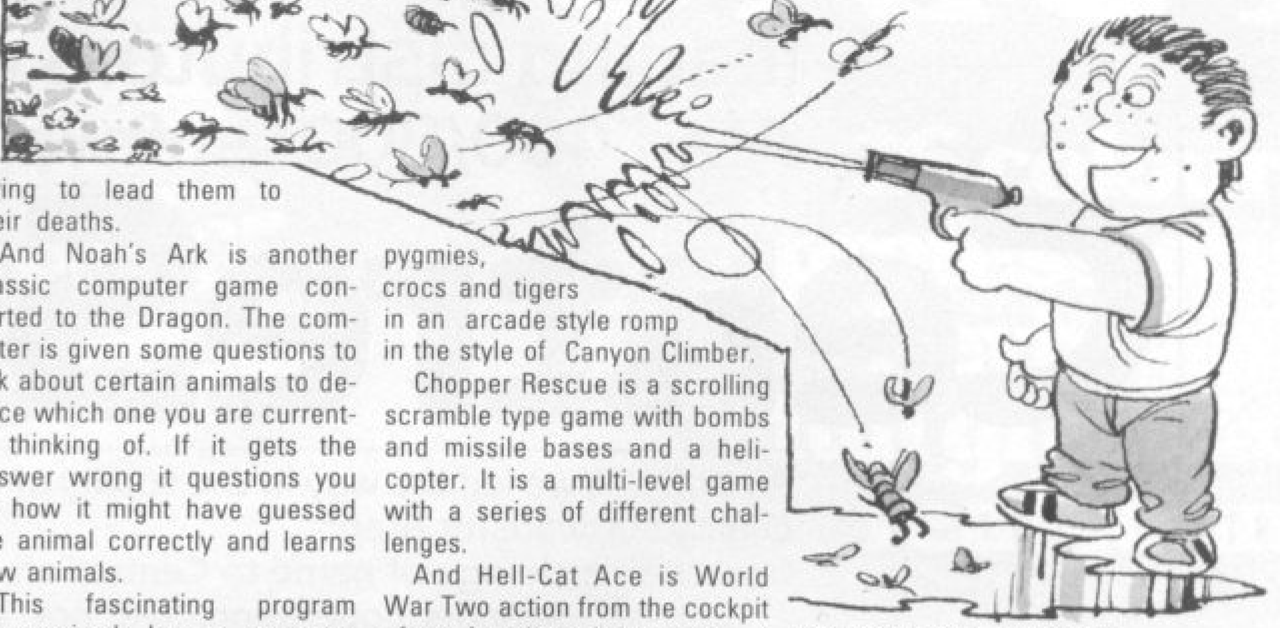
Using a joystick, you can chase the bugs to any corner of the screen to finish them off.

The game is for a 16K machine on cassette or 24K disc and costs £19.50 for the Atari 400. It comes from U.S. software house, Adventureland and is distributed over here by Calisto Computers of Birmingham.

Out of the same stable comes Tootie Fruitie which is a Pacman-type game — but this time without a maze!

Instead of gobbling dots, Tootie Fruitie challenges you to fruit, ice-cream and sweets, as you steer clear of the bugs.

Available for the Atari in 16K cassette or 32K disc from Calisto, it also costs £19.50.



SECRETS DOWN IN THE DUNGEON

DRAGON LORD

Dungeons and Dragons comes to computerised life on the Dragon in a multi-level adventure from the keyboard of Bob Chappell.

There are seven levels of dungeons in the Lord of the Dragon, all filled with some of the nastiest creatures you would expect to find in the dank dark places — trolls, hobgoblins and werewolves.

It is a combination of text and graphics from Item Limited, based at Fulmer, Buckinghamshire.

Other offerings from Item include a quotation quiz game, Who Said That with some 68 quotes to place.

Nightmare Park has you rushing about in a gloomy city park dodging the horrors and trying to lead them to their deaths.

And Noah's Ark is another classic computer game converted to the Dragon. The computer is given some questions to ask about certain animals to deduce which one you are currently thinking of. If it gets the answer wrong it questions you on how it might have guessed the animal correctly and learns new animals.

This fascinating program shows simply how a computer can be taught and gives an insight into the most basic artificial intelligence.

All the programs run on the Dragon 32 computer and cost £5.95 except Who Said That which is a little cheaper at £3.95.



A REAL MAN EXPLORES THE JUNGLE

FLOYD

It takes a man of real character to set off on a quest through a jungle infested by dangerous pygmies, hungry crocodiles and man-eating tigers . . .

Such a man is Floyd of the Jungle and his mission is set among tropical vegetation in the Atari 400. He is tackling the jungle to save his girl from the pygmies, crocs and tigers in an arcade style romp in the style of Canyon Climber.

Chopper Rescue is a scrolling scramble type game with bombs and missile bases and a helicopter. It is a multi-level game with a series of different challenges.

And Hell-Cat Ace is World War Two action from the cockpit of an American fighter pilot. A flight simulator with plenty of Japanese rivals to tangle with above the Pacific Ocean.

These three games all run on the Atari and come from Micropro Software in the U.S. They all cost £29.50 and are available from Calisto Computers in Britain.

Calisto has also commissioned a U.K. Battle-of-Britain version of Hell-Cat Ace, called Spitfire Ace which should appeal more to the U.K. audience.

THE MANY ARMED MONSTER . . .

BLACK SQUID

The Black Squid is a game of memory and menace on the seashore.

It's a shore you may never see again as you swim desperately through the rocks and giant clams, dreading the tap of a black tentacle on your shoulder.

The rocks are invisible in the murky waters, but everytime you hit one, that particular rock and all those you have previously hit flash up on the screen for a second.

Memorise their position if you can because rocks distract the squid and if you can lead the dark beast into a lot of them, you'll have a better chance of making it to the seashore at the top of the screen. The giant clams are more dangerous.

The Black Squid needs at least 8K or RAM expansion on the Vic-20 and it costs £9.95 from Preston-based Channel 8 Software.

Also new from Channel 8 is a children's game of I-Spy which is aimed at the learning to read age-group. There are 10 topics in the text-based game, from which a child can choose to spy.

Among these are I-Spy at the : zoo, circus, farm, shops and high street. Like the children's game, the computer gives the player a letter and asks it to guess what could be seen beginning with that letter at the given situation.

It retails at £9.95 and runs on the Atari 400 and 800.



Illustrations: Jon Davis

For trade eyes only.

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THE SEVEN

OUR TOP COMMANDER

Top space commander for turn one is Nicholas Tacticos who will be able to plan out future campaigns on a Colour Genie microcomputer.

The Spartans' space fleets under Nicholas' control made full use of the Plunder command to notch up top profits of **2,586** points.

The Spartan pirates raided routes between Tubox and Dusup, Widan and Barov, Jinis and Rivev, Soner and Widan, Widan and Opod to boost the score up.

Our top 10 scorers for the first turn were: Nicholas from Sinclair Road, London W1; J. Pedley, Cambridge, **2374**; D Mack, Farnborough, **2143**; C Jennings, Tonbridge, **1992**; A Youde, Leigh-on-Sea, **1907**; P Nevins, Warrington, **1845**; S Jones, Sheffield, **1795**; P Schafer, Hythe, **1730**; M Grant, Marden, **1652**; and C Parker, Carshalton, **1628**.

Other players didn't fare so well. But check up your own scores and the following list should show you how you fared: 126 players scored 500+; 24 players were between 400 and 499; 46 between 300-399; 48 between 200-299; 75 between 100-199; 461 between 0-199; and 1130 players finished up making scores below 0!

Nicholas takes a Colour Genie for his carefully considered Plundering of us poor merchants. The rest of you can lick your wounds and try to improve your scores on this next turn. We have all got a clean sheet to start our March turn.

For the March issue's individual winner we will provide three cassettes of games programs for his machine. Be it games centre or computer.

Mike Singleton, who wrote the Seventh Empire program runs his own Play-By-Mail game, Starlord. And he is offering a free rule book and two free turns of Starlord to any Seventh Empire player. Just write to Mike at the address given in the Seventh Empire Rulebook and quote your Seventh Empire code number for an introduction to the galaxy of Starlord.

THE WONDER OF COLECOVISION

If you're a fan of our Video Screens section you'll already have read about the new Colecovision Video Games system and how its graphics are going to change the face of TV games centres.

Now, through Seventh Empire we're offering you a chance to see these marvellous Colecovision games at first hand in their own home.

A Colecovision plus software is the prize for the overall winner of our Seventh Empire competition. How long the Seventh Empire runs in *C&VG* depends on how popular it is, but if it is still being included in September of this year we'll present the Colecovision to the player who has notched up the most points by then.

As the first turn was really just a chance to get to know the game and for us to check out the running times, the scores from that turn will not be included. So starting from March the computer will add your scores and the top scorer by the time our August issue's turn has been processed will have won a Colecovision.

With 32K of Rom and 17K of Ram, the Colecovision is closing the gap between TV games centres and microcomputers. It offers some marvellous detail in the graphics for several already successful arcade games which it features in its software catalogue. Its versions of Donkey Kong, Zaxxon, Lady Bug and Turbo are bound to be top sellers for the Colecovision. Venture is not such a well-known arcade game in this country but with its dungeons and dragons theme it will also capture hearts.

A worthy prize for our space fleet commander.

CHECKING YOUR ORDERS

Did you enter your Seventh Empire orders correctly? About 30% of you had some teething problems understanding the rules of movement and entered a few invalid moves.

Usually it was only one or two fleets that went astray. But if these stay "lost in space" it will affect your tribe's profit margins each turn.

So before you enter your fleet positions for turn 2 check your fleets for turn 1. If you have made any mistakes for a fleet, these will have been converted into Stay orders, in both Movement Phases.

Most common problems were from people not checking both orders against the Diplomatic Diagram to see whether they were at war or at peace with the empire they hoped to Attack, Trace or Move to.

Remember a Trade or Move between warring empires cannot take place in one turn — even via a neutral empire.

A word of warning about the Galactic Map this month as it only includes star numbers for players who took part this turn. Approximately another 10,500 fleets will be added to the March figures randomly, before the next turn is processed.

The Raid Penalty for this second turn is "2".

And the deadline for orders is **Wednesday February 23rd** so hurry them into us.

Only one player has an Imperial Ship this turn. Colin Jennings is in charge of the Dead Empire's ship for March.

Below is the Gateway Route profits table. The figures printed in white on black are the routes in which Plunderers made a profit. The black on white figures are routes on which Cargo runners made a profit. The table should be read by looking up the star you left in the vertical table and checking it against the star you moved to horizontally. The resulting figure tells whether the route profited pirates or merchants.

If you still haven't entered The Seventh Empire you will find a form on page 11. Send all Seventh Empire correspondence to: The Seventh Empire, Computer & Video Games, 8 Herbal Hill, London EC1R 5JB.

	As	Ba	Ca	Du	Er	Fa	Ga	He	Ix	Ji	Ko	Li	Mu	Nu	Op	Pu	Qa	Ri	So	Tu	Us	Va	Wi	Xu	Yu
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Cazuv	**1000**	500			**1000**	500	**1000**	1000		1000	**250**	500	500		**250**	166			333	1000	50	**1000**	**1000**	1000	1000
Dusup	500	500			1000		1000	1000	111	250	**250**	333	200		**250**			166	**250**	250		**250**	1000		**1000**
Erak	**1000**	111		1000			500		**1000**	142	**1000**	100	62	500	500		**250**		**1000**	1000	1000	500			
Fadis		**1000**		**1000**	**111**		**111**	**111**		166	**1000**	500		**1000**		500	**1000**	500	1000	500	111	111			333
Gazor		500	**111**	250		500		62		500	**1000**	**250**	166			333		1000	250	1000	111			333	**1000**
Hezod	200	111	**1000**		500		500			**27**		1000	125	83		125	**1000**	333		**250**	250		**1000**	**250**	
Ixip		500		500	250	500				166	**1000**	142	**1000**	500	166		**1000**	1000	83	**250**		500		**1000**	
Jinis				**111**	83	**1000**	**1000**		200			1000		**1000**		333	**1000**	1000	1000		100	1000	500	41	**1000**
Kolol	500	250	**1000**	333	1000		500	500		111		333	250	**1000**	500	**1000**				1000		166	250		**1000**
Lizag	**1000**					**1000**	500		250	333				50	**1000**	**250**	**250**	1000	**1000**		200	1000		**250**	
Mupip		**250**	166		1000	**250**	500	1000		50	**250**			**62**		**250**		**1000**	1000		500	500		1000	
Nuzet			166				500	333	500	333	**1000**	**111**	250		500	**1000**	1000	**1000**	**1000**	**62**	50		166		1000
Opod	**111**		**1000**	**111**	250	500	1000	200	100		**1000**	125	1000	**1000**		166	**111**	500	1000	**62**		1000			500
Pulud		500	166		250	333	1000	250		**1000**	500	500	**1000**	**111**					250	**250**	1000		**250**		500
Uavuv	333	166		**250**		333		250		500	500	**250**		1000	500			**1000**	500			500	250		500
Rivev	125	166	1000	250	1000	**111**	500	500	166	**1000**					1000	500	500		111	333	250		500		
Soner	500	166	500	500	1000		**250**	500	333	500		333	125	**1000**	1000	333	166	500		333		**250**	166		**1000**
Tubox	125	333	**250**	500	250	1000		500		333	**250**	333	**250**	250	125	250			1000		1000	**250**			
Usug	111	**1000**	500	**250**	**1000**	500	250	83			1000	**250**		**250**		250	166		1000				1000	1000	66
Vasux		**1000**		1000	**250**	100	1000		83	41	250	100	**250**		**250**	166		1000	250	250	250		500	**1000**	
Widan	166	62		**111**		**1000**	500		500	200	83		**1000**	1000	1000	333	166	**111**				500			
Xugod	500		500	500		250				100		166	**1000**		**1000**	333					500	**1000**	**1000**		250
Yuses	**62**	**1000**	**250**	333	**250**	**1000**	500	166	**1000**		**1000**	500	500	333				500			142		250	**1000**	

ITH EMPIRE

BATTLE REPORTS

Sixty battles raged in the galaxy last turn and all were successfully repulsed.

The most one-sided battle took place at Ixip where 272 defending fleets from the Sun Empire destroyed one attacking fleet from Bloodline-controlled Jadeg.

The closest contest was at Olex where Pirate Empire fleets stormed in and 94 attackers were narrowly defeated by 107 defenders. With the state of the Diplomatic Diagram this turn Olex may well fall earning rich pickings for the attackers.

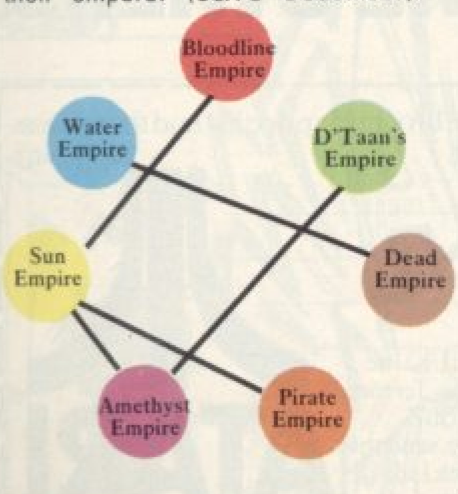
Several defending fleets suffered damages to the better mounted attacks and notes of all bonuses are included below: **Xokeg:** defenders suffered −1 loss; **Soner:** defenders' loss −2; **Vepoz:** —2; **Rurus:** —2; **Naxig:** −2; **Olex:** −1; **Okap:** −1; **Jadeg:** −5; **Kepar:** −1; **Yuses:** −2; **Sidal:** −7; **Hakub:** −2; **Minep:** −1; **Girex:** −1; **Otan:** −2. The heaviest loss for the defenders came at **Meden** where the Sun Empire attackers from poor Rorul shared out a deficit of −11 among the defending forces.

Only three star system defenders salvaged a profit from their successful defence: those at **Apel** earned a Battle Bonus of 1; the **Rolek** defenders added the energy of rich Minep attackers to their score, a Battle Bonus of 1 and **Tuxus** defenders also added one to their profits.

The only significant change in the Diplomatic Diagram below is that the Bloodline Empire and the Dead Empire have negotiated a peace treaty — finally forgiving that Ice Warrior for murdering their emperor (*C&VG* December).

FOZUZ ○ 71 466	LARUB ♦ 109 156	YIBET ♦ 129 182	XOLIP ♥ 129 150	ITIL ♥ 110 156	FUNUS ♥ 119 134	LULIP ♦ 59 243	YANOK ♥ 129 123	XOKEG ♦ 124 202	ISOX ○ 83 248
VIZAX ○ 80 246	QIRUS ♥ 174 90	HAZAN ♦ 96 176	ABOB ○ 115 119	SONER * 239 59	VEPOZ ♥ 109 195	QATOT ○ 101 122	HEZOD * 217 32	ASOL * 223 74	SUXEK ♥ 188 80
BAROV * 184 80	WIDAN * 179 64	RURUS ○ 102 202	MUPIP * 222 56	NAXIG ○ 100 200	BETID ♦ 98 167	WAVAB ○ 90 183	RIVEV * 182 33	MEGUD ○ 126 133	NABOK ○ 91 282
DALIX ♥ 100 169	OLEX ♥ 151 116	TASAT ♥ 122 123	CAZUV * 166 80	GOVAX ♥ 160 82	DITUG ♦ 136 124	OKAP ♥ 161 125	TOXAZ ♦ 73 384	CIXAN ♦ 100 236	GOTEG ♥ 109 121
ERAK * 154 71	KOVEP ♦ 113 163	USUG * 258 30	PEBOB ♥ 113 138	JADEG ♦ 118 162	ENAK ○ 119 178	KEPAR ♥ 141 125	UGON ♦ 144 92	POROV ♦ 89 185	JINIS * 242 62
FADIS * 112 228	LOKIK ♥ 178 101	YUSES * 141 103	XAPUS ○ 89 225	IXIP * 273 37	FAGIL ♥ 173 82	LIZAG * 183 63	YODAZ ♦ 104 175	XUGOD * 173 69	IBED ♥ 129 102
VASUX * 132 71	QUXIN ○ 100 169	HIPEB ♦ 139 126	ASOR ○ 103 170	SIDAL ♥ 133 178	VIZET ♦ 100 186	QAVUV * 185 75	HAKUB ○ 96 166	APEL ♦ 111 533	SABAG ♥ 130 110
BUREP ♥ 123 77	WAGAP ♥ 141 110	ROLEK ♥ 155 112	MINEP ○ 76 357	NUVEX ♥ 127 100	BAZIX ○ 125 119	WUPIV ♥ 108 140	RORUL ♥ 129 91	MEDEN ♦ 96 200	NUZET * 137 131
DUSUP * 143 116	OPOD * 152 75	TUBOX * 145 136	CIGER ○ 113 161	GAZOR * 249 76	DABAG ♥ 164 88	OTAN ♦ 93 159	TUXUX ○ 104 241	CESER ♥ 194 96	GIRIX ♦ 75 327
ELAR ○ 101 110	KERUP ♦ 102 170	ULEB ♥ 120 138	PIRAD ♥ 132 106	JAXEL ○ 98 108	EDIB ♦ 87 220	KOLOL * 151 94	UKOP ○ 75 185	PULUD * 210 76	JUVAK ♦ 90 135

The Galactic Map



The Diplomatic Diagram

Orders in Block Caps please

Name: ....

Code No: .... Telephone No: ....

	AT	1st Movement phase ACTION	1st Movement phase STAR	2nd Movement phase ACTION	2nd Movement phase STAR
FLEET 1					
FLEET 2					
FLEET 3					
FLEET 4					
FLEET 5					
FLEET 6					
FLEET 7					

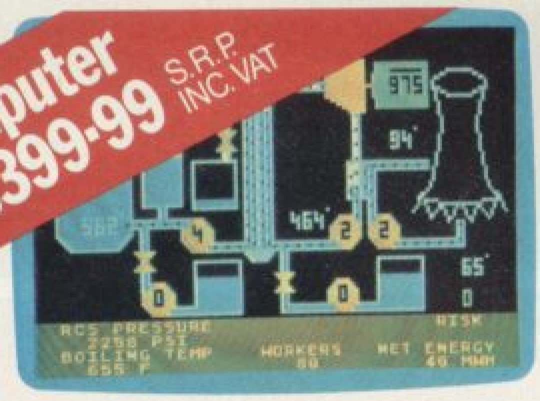
I wish to move the .... Empire's Imperial Ship from .... to ....

Please notify us separately of any change of address.

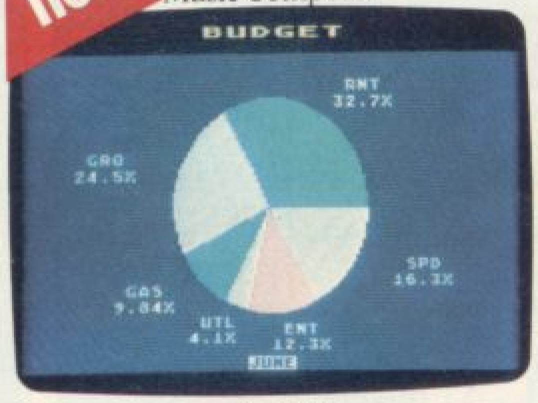
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Music Composer



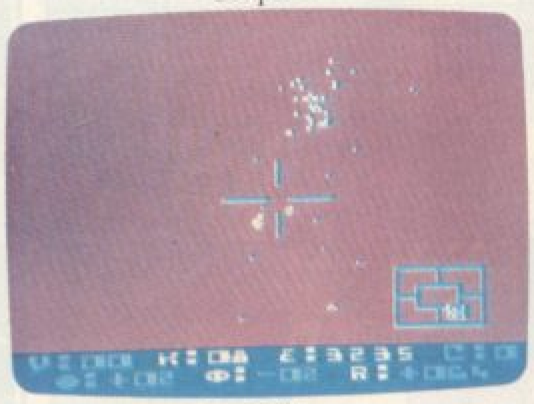
Scram



Graph-it



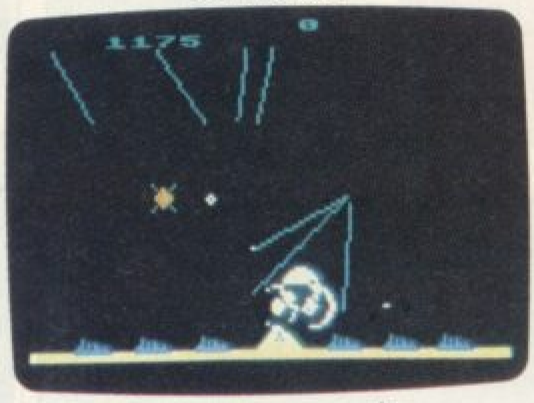
Intro to BASIC 1



Star Raiders



European Countries



Missile Command



Basketball

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PHEW! THIS CARPET STRETCHES FOR MILES!
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CHARGE!!
SPIDERY SNARL!
WAHH!
GASP!
ENTER THE PROGRAMMER
EEK! A SPIDER! UNGGG!
FAINT!
IT'S NO USE NOW. THE BEANS HAVE GONE COLD!

CHESS



WISDOM OF THE MACHINES

Computer chess has long been used by workers in the field of Artificial Intelligence as a testbed for human reasoning and how it can be programmed into a computer. A useful spin-off has been a gain in knowledge and understanding of the game itself.

Work at the Machine Intelligence Research Unit at Edinburgh University in the last few years has focused on the endgame King and Knight against King and Rook (abbreviated to KRKN).

Amongst those studying this ending have been two players of master strength — the Yugoslav player Ivan Bratko and U.S. master Danny Kopec.

Unlike most endgames which have been studied by Artificial Intelligence researchers, KRKN is genuinely hard even for masters, although fortunately rare in practical play.

Conventional wisdom states that the ending game is in general a fairly straightforward draw, but this turns out not to be true.

As the game goes on both sides must take care to spot any possible forks.

With the Rook's side (assumed to be white) to move, only a slight majority of legal positions are drawn. However, it is important for Black to stay in the centre of the board, because the won cases occur with the King in the corner.

Here is an example of a difficult position for the defending side with the King in the corner.

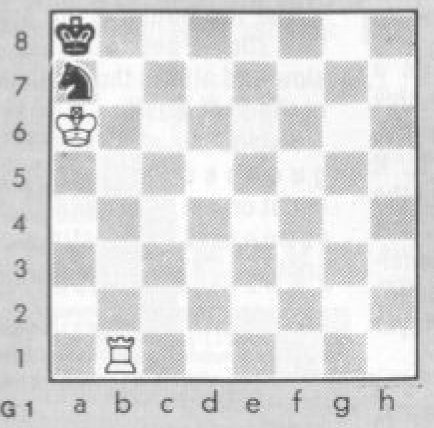


FIG 1

White to play by 1. K-N6!

If now 1.... N-Blch; 2. K-B7, N-R2; 3. R-N8 mate. So Black must play 1.... K-N1; whereupon

White wins by 2. R-N2! Now 2.... K-R1 allows a lethal pin, (3. R-R2), so Black must play 2.... N-Blch; with the continuation 3. K-B6 ch, K-R1; 4. K-B7 with a rapid checkmate. Strangely enough, Black can draw if it is his move in figure 1.

After 1.... N-B1; White has nothing better than 2. R-N3. Black now has the astonishing drawing move 2.... N-K2!

There must be few masters who would play such a move with confidence.

Now Black's Knight is separated from the King and there are mating threats to contend with. However, there is no way for White to exploit these facts.

For example, if 3. K-N6, K-N1; 4. K-B5ch, K-B2 with a drawn position away from the corner. This example is taken from *Advances in Computer Chess 2*, published by Edinburgh University Press in 1980, which contains two lengthy articles on the work of the Edinburgh team.

Although their work had much more ambitious goals concerning how expert knowledge might be represented and stored in a computer, from a chess viewpoint alone it is quite remarkable.

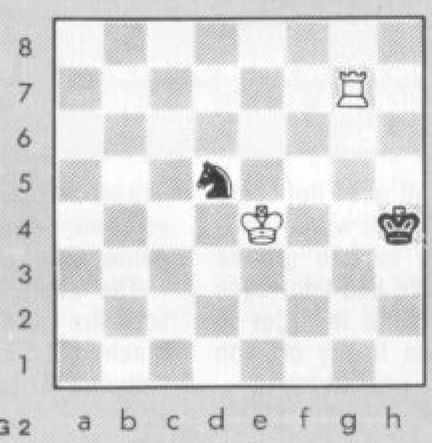


FIG 2

Here is another of their examples (Black to move).

Most strong players would surely now play 1.... N-KB3 ch to bring the King and Knight together (by N-R4 subsequently). However, Black's only drawing move is the apparently suicidal 1.... N-QB6ch.

Work of this kind calls seriously into question the idea that the endgame is well understood at least by grand masters.

Even for this four-piece endgame there are numerous previously unsuspected problems and even such an apparently definitive to me as Reuben Fine's *Basic Chess Endings* has clear-cut errors as well as severe omissions.

Figure 3 is an example of the textbook lapsing (Black to move).

This position is a variant of one which was first analysed in the ninth century. White can win in 14 moves. Black's first move is effectively forced: 1.... N-R4 ch; with the best play for both sides continuing 2. K-N5, N-N2.

Now the textbook gives 3. R-KB 8 an exclamation mark, although R-K R5 is best and wins one move sooner. More seriously, *Basic Chess Endings* rejects 3. R-KR7 because of 3.... K-N1; 4. K-N6 "drawn".

This is true but playing 4. K-B6 would win. After 3. R-KB8, Black's reply 3.... N-Q3 ch is forced.

The textbook analysis continues 4. K-QB6, N-QB5; 5. R-Q8! The exclamation mark is Reuben Fine's, but in fact it is a sub-optimal move which extends the game a further 6 moves than necessary until White's eventual win is reached.

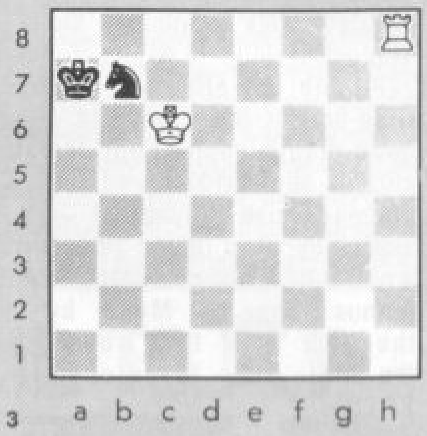


FIG 3

Analysis of this kind shows that the textbook not only occasionally misjudges whether a position is won or drawn but frequently gives a move which is not the best. If this is the case with a four-piece endgame, the infallibility of the rest of the textbook must be open to suspicion, to say the least!

The question remains, how is it possible to write with such confidence of the best moves in positions which seem to defy expert analysis?

Certainly the answer is not by analysing the game out to a conclusion each time. There are positions where it takes White 27 moves to win (i.e. 27 White moves plus 26 Black moves).

Assuming that each player has an average of 10 moves in every position, there would be 10 to the power 53 variations to consider before making the first move.

Nevertheless, the KRKN ending is now completely solved for every legal starting position. I shall return to this topic next month.



BY MAX BRAMER

VIDEOSCREEN

Getting the right joystick for your TV games centre is becoming as difficult as choosing the right squash racquet or set of golf clubs.

Adverts claim all sorts of things for sticks — that they will increase your scores and turn you into a pro-player.

We have already reported on the latest batch of souped-up sticks now being imported into this country from the States and this month the C&VG staff sat down at our Atari VCS and played a few games using the sticks — purely for research you'll understand!

Here we bring you the results of our bench-tests on four of the new sticks — plus the novel Wico Trackball and the simple but effective Byte Stick-Stand.

Our general impression was that these sticks add a great deal to your game and will prove a valuable addition to your games centre.

Most of the sticks we tested were in the £15 - £25 price range — less than one of the top of the range VCS cartridges. Pretty good value in our humble opinion.

We would like to thank Silica Shop, of Sidcup, Kent, who supplied the sticks we tested, and import them from the States.

STICK-STAND

The Stick-Stand was the cheapest and simplest product we tested. Basically it's a plastic stand into which your standard Atari joystick fits snugly. You also get a little red ball which slips onto the top of the standard stick to improve the grip.

Simple but effective. The wide-bottom base provides a good stable support for the stick — and that little red ball does improve playability — especially when the on-screen action gets fast and furious. Made by the U.S. firm Byte, the Stick-Stand costs £7.95.



TRACKBALL

The Wico trackball is truly a video games gourmet controller.

Once you get used to this unusual method of control and develop some speed, it gives you unbelievable responsiveness and adds greatly to playability of any game.

Left and right commands are fairly easy to master but up and down movements are a



little bit more difficult to control. You will have to readjust your Pacman technique accordingly!

My one reservation with the trackball was with the fire button. This was particularly heavy and clicked unneccessarily every time you released a missile.

It would also have been an improvement to have a fire button in the top right hand corner as well as the top left for left-handed people.

The trackball does not come cheap. At £48 you would have to forgo one or two games which you have had your eyes on for some time in order to pay for it. But in my opinion this would be well worth it.

DATABASE

If you are the proud owner of an Interton VC4000, Radofin, or Acetronic video games centre then you might not be quite so proud of the ever decreasing range of games available.

As these little-known machines have not generated the mass sales of, say the Atari, Phillips or Intellivision machines there is not a large enough owner base to support independent software. It also means that the firms who produce the machines do not tend to produce a very wide range of games themselves.

The situation has been improved slightly by the production of an adaptor from Voltmace which enables all software for the Database system to be played on any of the above machines.

The range of games for the Database is probably about the most up to date of these lesser known machines and includes versions of the popular arcade games Frogger and Pacman.

The adaptor plugs into the software ports on the various machines and the Data base software is then inserted into it.

The adaptor is available at £4.50 from the Baldock, Hertfordshire — based firm.

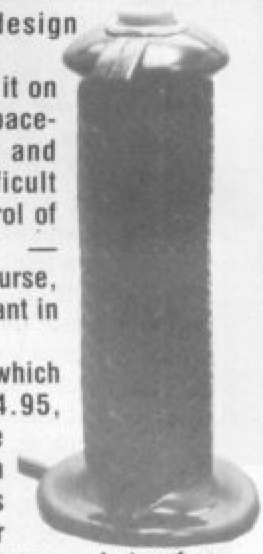


WICO LEAD

LE STICK

Le Stick from Datasoft is a really nice idea. A joystick without a base seems the easiest way to describe it. It works when the player tilts the stick in the direction he wants to move, and a pressure sensitive "switch" inside the stick freezes the action if the player squeezes it gently.

As I've said before it's a really nice idea. However in practice — on a video games centre anyway — it's just not responsive enough. You really need a lot of practice to get it working as well as one of the regular design sticks.



We tested it on maze and space-type games and found it difficult to keep control of the action — which, of course, is all important in TV games.

Le Stick, which costs £24.95, may come into its own when it's used for computer games — but unfortunately our testers just couldn't give it the *C&VG* seal of approval — despite the nice design concept.

STAR FIGHTER

Suncom's Starfighter is described by its makers as the ultimate joystick. Well, in our opinion, despite the two year warranty that comes with it, the stick fails to come up to this extravagant claim.

The Starfighter stick is short, stubby and difficult to get a good grip on — you'll soon be suffering from Astro Fighter thumb or some such affliction that all video game players suffer from time to time.

The fire button is not one of this stick's best features. It's slow and allows those aliens to escape too easily.

As you've probably guessed Starfighter is not one of *C&VG*'s favourite sticks. It costs £19.95.



WICO STICKS

The Wico Command Control range of joy sticks are the best known "gourmet sticks" as they are termed in the U.S., where they are currently the number one sellers.

There are two sticks in the range — the Red Ball stick and the Extended Lever stick.

Both are highly responsive

and offer you a choice of two fire buttons. One is mounted at the top of the joystick itself and the other at the base for those of you used to blasting away with Atari sticks.



The Red Ball joystick is the dearer of the two at £27.95. The Lever stick is £6 less — which I feel was not reflected in extra responsiveness.

Both Wico sticks are compatible with Atari VCS, Atari 400 and 800 and the Commodore Vic-20.



An adaptor enables the sticks to be plugged into the TI99/4a, TRS-80 Apple and home computers. Wico also produce an extension lead for their sticks which is useful for those people who like to sit in their armchair and play. It sells for £5.95.

TAKE A MAD GORILLA HOME TODAY!

DONKEY KONG

If Mad Mario, a crazy gorilla and a beautiful blonde mean nothing to you then you have not played Donkey Kong.

This hit arcade game is now available in cartridge form for Atari VCS owners.

A couple of shops who managed to get hold of advance copies of the game before Christmas sold out in a matter of days. Coleco have promised fresh supplies for March.

For the uninitiated you play the part of Mad Mario who is trying to rescue his girlfriend from the clutches of a gorilla.

To get to your girl you must run along steel girders and up ladders while hopping over barrels and fireballs that the gorilla is throwing down at you.

Donkey Kong is one of a range of well known arcade titles which have been taken out of the arcade and converted to VCS format by the new video games company Coleco.

Also released this month are Gorf — a space attack game.

Wizard of Wor takes you down into the dungeons where you have to outwit and vapourise the wizards monsters. You have a radar device to help you negotiate the constantly changing maze.

Carnival is a simulation of a fairground shooting gallery. Blaze away at the clay pipes, dancing bears and sitting ducks.

The Coleco range of VCS games will be available from most major video games stockists at around £28.

Coming soon are Zaxxon, Turbo, Lady Bug and Cosmic Avenger.

Most of Coleco's titles will shortly be available for the Intellivision machine and also for ColecoVision's own machine which will be launched in the Spring.

This year hundreds of cartridges for TV games centres will go on sale. Not just new and original games but new versions of old favourites.

The Atari VCS will continue to get the majority of the new releases as more people own Atari centres than any other machine and therefore there are greater potential sales.

To help you make the best choice when buying a new game *C&VG* will be reviewing similar games in one batch and picking the best one.

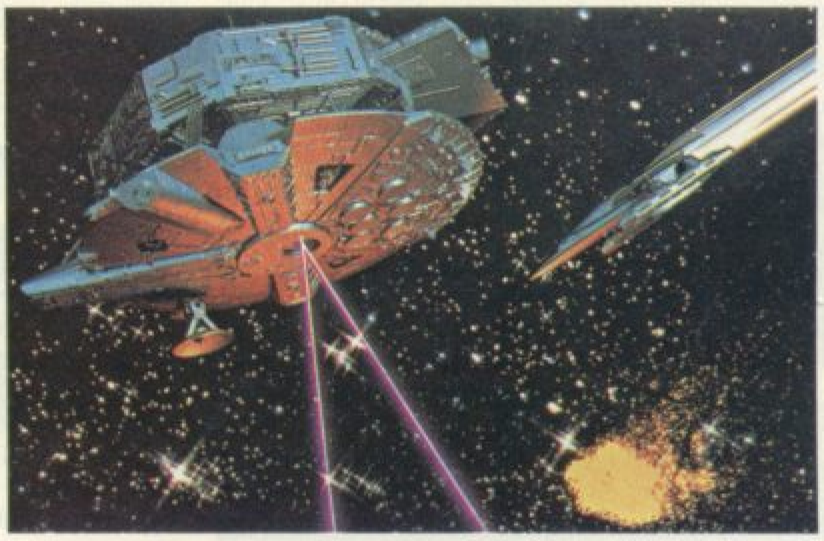
GO WHERE OTHERS FEAR TO FLY

STAR RAIDERS, STARMASTER, STAR VOYAGER

Nowhere is the competition for sales tougher than deep in space. You can do battle with the Krylons of Star Raiders, Zakorians of Star Voyager, and the Starfighters of Starmaster.

These 3D space games from the big three VCS manufacturers Activision, Imagic and Atari are based on the same idea.

You pilot a craft hurtling through space at breakneck speed. Your mission is to seek out the enemy ships and destroy them while avoiding their fire and protecting your Starbases.



The first cartridge I plugged in was Atari Star Raiders.

This is an impressive package complete with a touch-pad which plugs in to the right hand joystick socket on your VCS, and operates in conjunction with the joystick.

The touch pad controls five flight functions whilst the other joystick steers the ship and fires your photon torpedoes.

You can call up the galactic map to see your position, your starbase, and the whereabouts of the Krylons. By pressing fore view you go back to the view from the cockpit of your ship.

Hyperwarp sucks you through the galaxy at great speed to the space sector you have selected on the galactic map.

The novel touch-pad add-on controls a tracking computer and protective force field, which you must learn to use selectively as they draw heavily on your fuel supply.

Star Raiders is a most playable game. Difficult but addictive. At first it requires a lot of effort to master all the controls.

Imagic's Star Voyager is much easier to get the hang of.

Apart from the oncoming aliens there are only three other controls to be watched — radar screen, energy level, and the number of enemy hits.

Star Voyager is also easier because the aliens come at you in a uniform corkscrew movement as opposed to the random dodging of Starmaster and Star Raiders.

Star Voyager does have one unique feature. Every so often you get an audible signal telling you a star portal is in close proximity.

You must fix your sights on this and fly towards it.

As you get nearer the tiny square will grow larger and larger till it fills the screen which then flashes through a sequence of colours. When this is done you have then passed safely through a star portal.

Activision's Starmaster is the closest to the Atari original with a galactic map and an excellent superspeed simulation.

Starmaster has the best attack computer display of the three games. As you fly into a sector occupied by enemy ships the control panel turns red. Hits on the enemy cause the screen to flash red. Yellow flashes mean the enemy has scored a direct hit on your craft.

Starmaster and Star Voyager both retail at around £25.00.

For game presentation and sheer game play Star Raiders at £29.95 is the best of the bunch. Although Starmaster gives the toughest fight.

PIGGIES IN THE MIDDLE

TIPS ON AMIDAR



The secret of success at maze-chase games is knowing what to expect of your pursuers.

In the two screens of Amidar, the chasing warriors and cuddly toys are more predictable than most arcade pursuers — one goes around the outside of the rectangle filled screen (the tracker) and the other four (the Amidars) turn each time they come to a corner.

Amidar is a game of screen filling. A network of staggered rectangles provide the lines for your gorilla to travel on and each time you paint around a square it fills in, adding to your score.

The first screen Amidars are warriors and your best tactic is to go to the bottom left-hand corner and clear that area. At this point all the Amidars are on fixed routes and remain so until you reach your next objective, the top right corner, when they all begin to follow you as best they can.

Fill this corner while the tracker is at the top of the screen and follow it around the edge closely. Then Amidars won't cut in between you and the tracker.

It will lead you to the top left-hand corner. Clear that area and head for the screen centre to do the same there, before moving to the final corner.

Leave the square in this corner until the Amidars are surrounding you, then complete it. This will have the same effect as eating a Pacman energiser — the Amidars will turn blue and turn tail and can be eaten for bonus points.

Don't blindly follow them, they are not any slower but aim to meet them head on. A dead Amidar falls to the bottom of the screen and if it hits you on the way you'll lose a life.

You have now earned a bonus screen, consisting of a rough maze connecting a female Amidar, pink, piggish cuddly toy, at the top of the screen and a bunch of bananas at the bottom. Press the "jump" button as the pig reaches the entrance that leads to the bananas, for a 5,000 point bonus.

Amidar's second screen proper turns you into a paint roller. The Amidars and tracker are all pink pigs and you can only get points for squares connected to one-another.

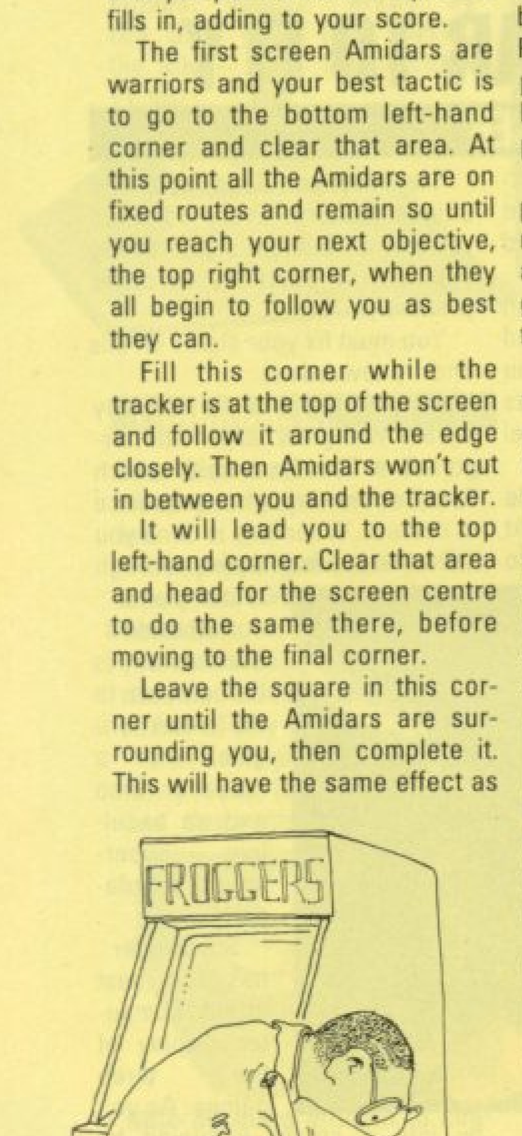
Start by going right up the middle of the screen for 2,740 points. You can then go to the four corners to turn the pigs yellow and chomp up a bonus.

If the tracker comes off the outside loop during this screen, beware! Any second she is going to slip right onto your tail and stay there. Every time you clear all three screens, you get a 2,000 point bonus, then it's back to the first screen with an extra Amidar.

The "jump" button causes the Amidars to spin for a second and you can then pass through them. Press it only when right next to one, on a collision course and don't hold the button down, it repeats.

You only get so many jumps each screen and you cannot afford to waste any of them. So, be positive.

Extra lives come at 50,000, 70,000 and every 500,000.



BLINK AND DON'T MISS

EYES

If you don't like being watched, you're in for a nervous time when you play Eyes — because they're everywhere!

Small eyes haunt the screen maze, while their larger compatriots roam at will and if they blink, you may well have looked your last upon this life.

You also resemble an eye-like creature in this game and your task is to eat as many of the smaller eyes (Pacman fashion) as you can while travelling around the maze and clear the screen.

When confronted by a larger specimen, your options are to fire quickly before it can turn to look in your direction or dodge out of its line of sight.

Missiles from the eyes travel in a straight line. And while they do travel faster than you can run, death is hardly instantaneous. It is possible to dodge around a corner and watch it pass harmlessly by.

The secret of survival is not to get caught on a long corridor a few inches away from the nearest exit and not to be tempted to fire at an eye in the mistaken belief that its death will stop the oncoming bullet . . . it won't.

The only safe way to fire at eyes, is before they have fully turned a corner.

The game is played at a leisurely pace and appears a lot easier than it actually is. Killed eyes return to hunt a few brief seconds later and materialise on the outside corridors — so keep an eye out for them.

A DRAGON AT THE END OF THE TUNNEL

SUPER ZAXXON

Super Zaxxon takes the graphics of its predecessor and improves the game.

You still have to attack the blue space fortress, watching your shadow and altimeter to gauge position and height above the deadliest of arcade batteries. Missile's, turret guns, tracking antennas and force fields bar your way and there's a small tunnel which must be entered low in the centre of the screen.

This is made more awkward by having a missile launching pad just before the tunnel entrance. The tunnel is a new Zaxxon feature which inhibits your altitude and makes the player fight his way past planes, flying minelayers, self-destructing robot spacecraft and indestructible mines.

The final challenge is with a larger-than-life fire-breathing dragon. Only six hits into his fiery mouth can kill the dragon which dwarfs your attack vessel.

The most useful firing you can do in Super Zaxxon is to help check your altitude and it still suffers from looking better than it plays.

ACTION



The year of the mutant – that's what 1983 is turning out to be. Pinball manufacturers are plundering the video world for game themes and some strange hybrids are appearing.

Williams have gone to that all-time arcade winner, Defender, for a theme. Their latest pinball shown at the recent Amusement Trade Exhibition – has mutants, swarmers and smart bombs built in to the game. And a complicated pin it is too.

To start off with the machine has four buttons – one pair to operate the flippers, the other two with different functions.

The second button on the right-hand side of the machine operates a lane change feature. The left hand button works a "kick-back" device – similar to a feature on early Bally games – which saves a ball destined for oblivion down the out chute. You have to earn points to use it of course!

There's also a mysterious Smart Bomb feature which our reviewer, Gary Flower of the Pinball Owners Association didn't have time to fathom. It's also a multiball game which adds to the excitement. All in all a challenging and different pin.

HAVE A BALL DOWN BELOW

MR DO

The joys of tunnelling are fully explored in the surrealistic world of Mr Do.

Dig-Dug first tempted gamesters below the surface, but Mr Do takes the best from that game theme and improves on it.

Mr Do is a pixie-like creature with a magic ball who spends his time below ground being chased by some small hungry crimson dinosaurs. He runs through existing tunnels and can create new ones, only more slowly.

The dinosaurs can also dig new passage-ways but prefer to chase you through tunnels of your own making.

Large golden apples lie buried in this subterrannean world and these act like the rocks in Dig-



Dug. Tunnelling up underneath makes them rather shaky and a split second later they plummet down on top of anything following you.

When the dinosaurs get too close you can spin around and fire your magic ball at them. This bounces through the passage way and can knockout a whole herd of pursuing creatures if it hits the leading one. But they are only KO-ed briefly and your magic ball disappears for a number of seconds.

After a while the dinosaurs split up and start coming at you from different angles. When things get too close for comfort and even your magic ball can't keep them all at bay, then there is another answer.

A flashing prize in the centre of the screen can be collected by Mr Do and this has the effect of disabling the dinosaurs. But instead a whole host of new blue monsters with gnashing teeth appear at the top of the screen and come after you.

These can also be KO-ed by the magic ball and will also tire in their chase and eventually give up to be replaced by the dinosaurs again.

The mazes are dotted with tempting red cherries which Mr Do must eat. Once all these have been cleared he is free to go onto the next screen full of yet more cherries, apples and dinosaurs but with a different maze.

AN ISLE SO NEAR . . .

SWIMMER

Come on in, the water's . . . er- . . . interesting. Swimmer may look just like a plunge into the river in search of an idyllic isle but there's a lot lurking beneath the blue waters.

Treasure island is what your Swimmer should be aiming for with the aid of an eight-way joystick and a dive button but there's a few problems going against the current.

There's the driftwood for example. And watch out for those curious turtles, they bite! You can gather the floating fruit for bonus points but keep a watch out for a monstrous crab, which is waiting for you at the end of the third screen.

Small guerrilla crabs also close in, fast and hungry and it's time to hit the dive button, hold your breath and swim under your adversaries.

If you aim for a golden ring, floating amongst the enemies, it can turn your swimmer into a superman, invulnerable to your enemies, but only for so long.

Back to mere mortal and there are sly water spiders and vicious piranhas in the river.

The aim is to defeat the host of predators and find the sanctuary of treasure island.



THE RECORDS TUMBLE

The competition on high scores is really hotting up with some records changing hands almost daily.

Tim Haywood's Pacman score has been the main victim of the host of new record scorers. It has now been doubled.

Tony Eaton found his way into the local paper with a 1,674,500 score. He munched his way through 138 screens and it took him two and a half hours. That beat most of the claimants for the Pacman record.

But he was recently bettered by David Ross, a veteran of our 1982 Best Arcade Game Player title. David rules the roost on the Isle of Wight with a score of 2,934,470.

A humble editor offers 17,410 on Pengo which was scored at the Amusements Trade Exhibition. It probably won't last for long.

Other games which provided a torrent of response were: Amidar (it'll be some time before anyone beats our current champion) Pheonix and Scramble.

We're still keen to receive some scores for Tron, Space Dungeon and Tutankham.

SCRAMBLE 2,332,230 James Thomas	FROGGER 116,150 Richard George	PACMAN 2,934,470 David Ross
TEMPEST 1,080,260 Paul Mitchell	DIG-DUG 999,990 Tooba Zaidi	AMIDAR 782,010 Adrian Eyre
GORF 972,830 Gary Miller	DONKEY KONG 428,300 John Bull	ROBOTRON 537,450 David Ross
GALAGA 1,223,290 Carl Warrington	QIX 263,820 Sarabjit Singh	PENGO 17,410 Terry Pratt
FAST FREDDIE 1,279,110 John Greggor	CRUSH ROLLER 471,530 Alan Dowler	PHEONIX 488,330 Martyn Monagham



BY JAMES DAVIES

DEFUSE

RUNS ON A TEXAS TI99/4 OR 4a IN 16K

A chain of nuclear reactors is ready to explode — and only you can stop them!

Your job is to defuse this potentially explosive situation by entering each reactor and shutting it down.

The reactors appear at random, and you must steer your nuclear expert through them. This defuses the reactors — but gives your little man a radioactive trail which he must not cross.

There's another snag too — the reactors must be defused in the right order — otherwise it's apocalypse time!

The game features full colour graphics, sound effects and full instructions. It will run on a Texas TI99/4 or 4a no peripherals are needed.

```
100 REM DEFUSE
110 REM BY J. DAVIES
120 REM
130 REM SET CHARACTERS
140 CALL CLEAR
150 CALL CHAR(104,"000000000007071F1F")
160 CALL CHAR(105,"0000243CFFFFFFFF")
170 CALL CHAR(106,"00000000E0E0F8F8")
180 CALL CHAR(107,"1F1F070707073F3F")
190 CALL CHAR(108,"F8F8E0E0E0E0FCFC")
200 CALL CHAR(109,"3F3F7F7F7F232313")
210 CALL CHAR(110,"FFFFFFFFFF3C1800")
220 CALL CHAR(111,"FCFCFEFEFEC4C4C8")
230 CALL CHAR(112,"130B0B0707030FFF")
240 CALL CHAR(113,"")
250 CALL CHAR(114,"C8D0D0E0E0C0F0FF")
260 CALL CHAR(96,"18183C5A99182442")
270 CALL CHAR(97,"187E7E1818187EFF")
280 CALL COLOR(10,5,16)
290 CALL COLOR(9,14,16)
300 CALL COLOR(12,15,15)
310 CALL COLOR(11,12,16)
320 RESTORE
330 FOR I=136 TO 144
340 READ A$
350 CALL CHAR(I,A$)
360 NEXT I
370 DATA 0010301010101038,
0038440408102O7C,0038440418044438,
00081828487C0808,007C407804044438
```

Illustrations: Terry Rogers

```
380 DATA 0018204078444438,007C040810202020,
0038444438444438,003844443C040830
390 DEF RAN(X)=INT(X*RND)+1
400 RANDOMIZE
410 FCOLOUR=16
420 CALL COLOR(16,9,9)
430 INPUT "DO YOU WANT INSTRUCTIONS ":Q$
440 IF SEG$(Q$,1,1)="Y" THEN 450 ELSE 480
450 CALL CLEAR
460 GOSUB 2110
470 GOTO 500
480 IF SEG$(Q$,1,1)<>"N" THEN 430
490 REM SKILL LEVEL=No. REACTORS-4
500 CALL CLEAR
510 INPUT "GIVE YOUR SKILL LEVEL
(1 TO 5) ":SKILL
515 SK=SKILL+4
520 IF (SK>9)+(SK<5)THEN 510
530 FOR I=2 TO 8
540 CALL COLOR(I,2,1)
550 NEXT I
560 REM BORDER
570 CALL CLEAR
580 CALL SCREEN(16)
590 CALL HCHAR(1,1,152,32)
600 CALL HCHAR(24,1,152,32)
610 CALL VCHAR(1,1,152,24)
620 CALL VCHAR(1,32,152,24)
630 REM DISPLAY REACTORS
640 CALL COLOR(3,16,5)
650 CALL COLOR(4,16,5)
660 CALL COLOR(15,16,9)
670 CALL COLOR(14,16,9)
680 FOR REA=1 TO SK
690 R=RAN(22)
700 C=RAN(32)
710 REM CHECK AREA IS CLEAR
720 FOR RSCAN=R-1 TO R+5
730 FOR CSCAN=C-1 TO C+4
740 CALL GCHAR(RSCAN,CSCAN,GET)
750 IF GET<>32 THEN 690
760 NEXT CSCAN
770 NEXT RSCAN
800 CALL HCHAR(R,C,104)
810 CALL HCHAR(R,C+1,105)
820 CALL HCHAR(R,C+2,106)
830 CALL HCHAR(R+1,C,107)
840 CALL HCHAR(R+1,C+2,108)
850 CALL HCHAR(R+2,C,109)
860 CALL HCHAR(R+2,C+1,110)
870 CALL HCHAR(R+2,C+2,111)
880 CALL HCHAR(R+3,C,112)
890 CALL HCHAR(R+3,C+1,113)
900 CALL HCHAR(R+3,C+2,114)
910 CALL HCHAR(R+1,C+1,135+REA)
920 CALL SOUND(200,800,0)
930 CALL SOUND(100,750,0)
940 NEXT REA
950 REM
960 REM THE GAME.......
970 R=RAN(22)+1
980 C=RAN(30)+1
990 CALL GCHAR(R,C,GET)
1000 IF GET<>32 THEN 970
1010 CALL HCHAR(R,C,96)
1020 REM GET KEY AND MOVE
1030 CALL KEY(3,K,S)
1040 RT=R+(K=69)-(K=88)
1050 CT=C+(K=83)-(K=68)
1060 CALL GCHAR(RT,CT,GET)
1070 IF GET=113 THEN 1180
1080 IF GET=120 THEN 1410
1090 IF GET<>32 THEN 1140
1100 CALL HCHAR(R,C,120)
1140 FCOLOUR=25-FCOLOUR
1150 CALL COLOR(14,FCOLOUR,9)
1160 CALL COLOR(15,FCOLOUR,9)
1170 GOTO 1030
1180 REM DEFUSE
1190 CALL GCHAR(R-3,C,GET)
1200 A$=CHR$(GET-87)
1210 A=VAL(A$)
1220 IF A<>N+1 THEN 1820
1230 N=N+1
1240 CALL HCHAR(R-3,C,GET-87)
1250 GOSUB 1330
1260 IF N=SK THEN 1990
1270 R=R-5
1280 CALL GCHAR(R,C,GET)
1290 IF GET<>32 THEN 1410
1300 RT=R
1310 R=R+5
1320 GOTO 1100
1330 RESTORE 1390
1340 FOR I=1 TO 21
1350 READ NOTE
1360 CALL SOUND(-500,NOTE,0)
1370 NEXT I
1380 RETURN
1390 DATA 400,420,440,460,480,
500,520,540,560,580,600
1400 DATA 580,560,540,520,500,
480,460,440,420,400
1410 REM RADIATION DEATH
1420 FOR I=30 TO 1 STEP -3
1430 CALL SOUND(200,-6,I)
1440 NEXT I
1450 FOR I=1 TO 10
1460 CALL COLOR(9,14,16)
1470 FOR D=1 TO 50
1480 NEXT D
1490 CALL COLOR(9,3,16)
```

➔





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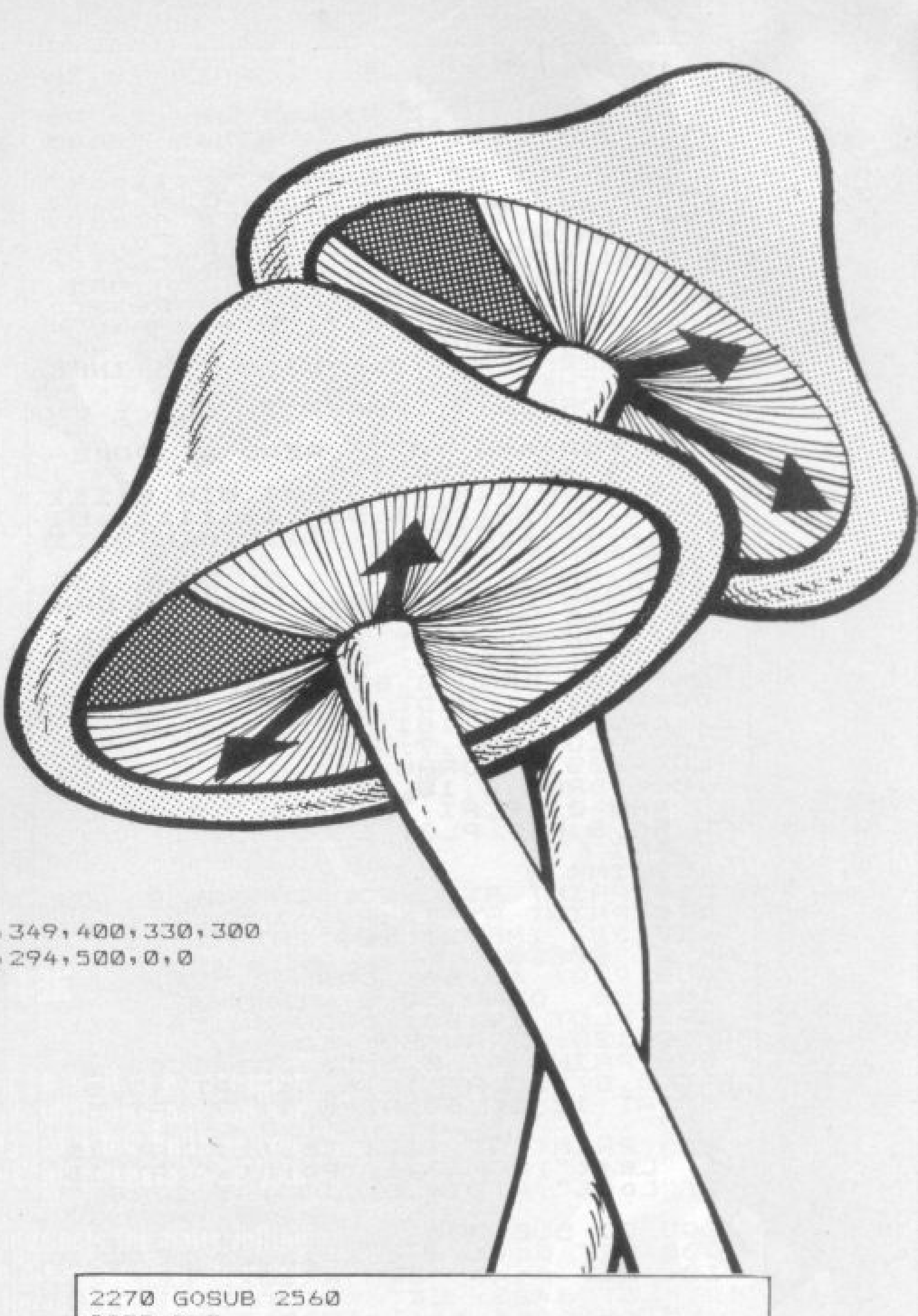
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```
1500 FOR D=1 TO 50
1510 NEXT D
1520 NEXT I
1530 CALL COLOR(9,2,16)
1540 CALL HCHAR(R,C,97)
1550 CALL GCHAR(R+1,C,GET)
1560 IF GET<>105 THEN 1580
1570 CALL HCHAR(R+5,C,120)
1580 GOSUB 1730
1590 CALL CLEAR
1600 CALL COLOR(3,2,1)
1610 CALL COLOR(4,2,1)
1620 PRINT " YOU RAN OVER YOUR TRAIL"
1630 PRINT "        YOU HAVE DIED"
1640 PRINT :::
1650 PRINT "WOULD YOU LIKE TO TRY AGAIN"
1660 PRINT "(YES OR NO)";
1670 N=0
1680 INPUT Q$
1690 IF SEG$(Q$,1,1)="Y" THEN 430
1700 IF SEG$(Q$,1,1)="N" THEN 1720
1710 GOTO 1680
1720 STOP
1730 REM FUNERAL MARCH
1740 RESTORE 1800
1750 READ NOTE,DUR
1760 IF (NOTE=0)*(DUR=0) THEN 1790
1770 CALL SOUND(DUR,NOTE,O)
1780 GOTO 1750
1790 RETURN
1800 DATA 294,400,294,300,294,240,294,300,349,400,330,300
1810 DATA 330,350,294,350,294,300,277,350,294,500,0,0
1820 REM WRONG REACTOR
1830 FOR I=1 TO 30 STEP 2
1840 CALL SOUND(-1000,-7,I)
1850 FCOLOUR=25-FCOLOUR
1860 CALL SCREEN(FCOLOUR)
1870 NEXT I
1880 CALL SCREEN(9)
1890 GOSUB 1730
1900 CALL CLEAR
1910 CALL SCREEN(16)
1920 CALL COLOR(3,2,1)
1930 CALL COLOR(4,2,1)
1940 PRINT "YOU DEFUSED THEM IN THE"
1950 PRINT "      WRONG ORDER"
1960 PRINT ::"THEY ALL BLEW UP"
1970 PRINT "YOU WERE KILLED!"
1980 GOTO 1650
1990 REM SUCCESS.....
2000 GOSUB 1330
2010 CALL CLEAR
2020 PRINT "         CONGRATULATIONS"
2030 CALL COLOR(3,2,1)
2040 CALL COLOR(4,2,1)
2050 N=0
2060 PRINT ::::
2070 PRINT "WELL DONE...YOU JUST SAVED"
:"THE NATION"
2080 PRINT :::
2090 GOTO 1640
2100 REM INSTRUCTIONS
2110 FOR I=2 TO 8
2120 CALL COLOR(I,16,5)
2130 NEXT I
2140 CALL SCREEN(5)
2150 CALL CLEAR
2160 R=1
2170 M$="DEFUSE"
2180 GOSUB 2560
2190 R=2
2200 M$="********"
2210 GOSUB 2560
2220 R=4
2230 M$="DEFUSE THE NUCLEAR REACTORS"
2240 GOSUB 2560
2250 R=5
2260 M$="EACH ONE IS ABOUT TO EXPLODE"
```

```
2270 GOSUB 2560
2280 R=7
2290 M$="THEY ARE DEFUSED BY MOVING"
2300 GOSUB 2560
2310 R=8
2320 M$="UP BETWEEN THE REACTORS LEGS"
2330 GOSUB 2560
2340 R=10
2350 M$="THEY MUST BE DEFUSED IN THE"
2360 GOSUB 2560
2370 R=11
2380 M$="CORRECT ORDER"
2390 GOSUB 2560
2400 R=14
2410 M$="BEWARE OF THE RADIATION TRAIL"
2420 GOSUB 2560
2430 R=15
2440 M$="WHICH YOU LEAVE BEHIND"
2450 GOSUB 2560
2460 R=17
2470 M$="USE THE FOUR ARROW KEYS"
2480 GOSUB 2560
2490 R=20
2500 M$="PRESS ANY KEY TO PLAY DEFUSE"
2510 GOSUB 2560
2520 CALL KEY(0,K,S)
2530 IF S=0 THEN 2520
2540 RETURN
2550 REM MESSAGE DISPLAY
2560 C=16-LEN(M$)/2
2570 FOR I=0 TO LEN(M$)-1
2580 CALL HCHAR(R,C+I,152)
2590 CALL HCHAR(R,C+I,ASC(SEG$(M$,I,1)))
2600 NEXT I
2610 RETURN
```

```
  10 PAPER 7: CLS : BORDER 7: IN
K 0
  20 PRINT AT 0,0;"Welcome To Po
ol!!";AT 2,6;"By ©Jonathan Yeoma
ns©"
  30 PRINT AT 5,0;"Instructions"
;AT 6,0;"____________";AT 9,0;"1
)Wait For The Computer To Break"
  40 PRINT AT 11,0;"2)Aim For Th
e Ball Of Your ";AT 13,2;"Choice
";AT 15,2;"Input A Diretion And
Strength.";AT 17,2;"Press Return
 And Watch";AT 20,5;"Press Any K
ey To continue"
  50 BEEP RND*.1,RND*50: IF INKE
Y$="" THEN GO TO 50
  90 BORDER 7: PAPER 7: CLS : IN
K 0
 100 FOR n=0 TO 7: READ a: POKE
USR "a"+n,a: NEXT n
 110 DATA BIN 00111100,BIN 01111
110,BIN 11111111,BIN 11111111,BI
N 11111111,BIN 11111111,BIN 0111
1110,BIN 00111100
 120 INK 4: PLOT 119,0: DRAW 136
,0: DRAW 0,166: DRAW -136,0: DRA
W 0,-166
 130 INK 4: PLOT 135,7: DRAW 104
,0: PLOT 248,15: DRAW 0,64: PLOT
 248,90: DRAW 0,63: PLOT 126,15:
DRAW 0,64: PLOT 126,90: DRAW 0,
62: PLOT 136,161: DRAW 103,0
 140 PLOT 134,7: DRAW -8,8,-PI:
PLOT 239,7: DRAW 9,8,PI: PLOT 12
5,80: DRAW 0,10,-PI: PLOT 249,80
: DRAW 0,10,PI: PLOT 247,153: DR
AW -8,8,PI: PLOT 126,153: DRAW 8
,8,-PI
 150 INK 0
 160 PRINT AT 3,23; INK 1;"●"
 170 PRINT AT 14,23; INK 2;"●";A
T 15,22; INK 2;"●●●";AT 16,21; I
NK 2;"●●●●●"
 180 PLOT 43,80: DRAW 0,50: PLOT
 18,105: DRAW 50,0
 190 PLOT 19,80: DRAW 50,50: PLO
T 19,128: DRAW 50,-50
 200 PRINT AT 5,5;"1";AT 5,8;"2"
;AT 8,8;"3";AT 12,8;"4";AT 12,5;
"5";AT 12,1;"6";AT 8,1;"7";AT 5,
1;"8"
 210 PRINT AT 14,1;"Balls";AT 15
,1;"Left";AT 17,1;"Points";AT 18
,1;"Lost";AT 14,8;"10";AT 17,8;"
0"
 290 GO SUB 700
 300 LET potted cue=1260: LET bl
=10: LET pl=0: DIM g(10): LET c=
13: LET d=23: LET returnball=310
: LET missed ball=1000: LET pott
ed ball=800: LET hit second red=
650:: DIM a(10): LET hit red=500
: LET x=13: LET y=23: LET s=1: L
ET s1=0
 305 LET g(3)=c: LET g(5)=d
 310 INPUT "Direction ";d: INPUT
 "Stength 7 to 40 ";s1
 315 IF s1>40 OR s1<7 THEN GO TO
 310
 316 LET x=g(3): LET y=g(5)
 317 LET s=0
 320 IF d=1 THEN LET x1=-1: IF d
=1 THEN LET y1=0
 325 IF d=2 THEN LET x1=-1: IF d
=2 THEN LET y1=1
 330 IF d=3 THEN LET x1=0: IF d=
3 THEN LET y1=1
 335 IF d=4 THEN LET x1=1: IF d=
4 THEN LET y1=1
 340 IF d=5 THEN LET x1=1: IF d=
5 THEN LET y1=0
 345 IF d=6 THEN LET x1=1: IF d=
6 THEN LET y1=-1
 350 IF d=7 THEN LET x1=0: IF d=
7 THEN LET y1=-1
 355 IF d=8 THEN LET x1=-1: IF d
=8 THEN LET y1=-1
 400 PRINT AT x,y; INK 1;"●": BE
EP .05,20: PRINT AT x,y;" "
 410 LET x=x+x1: LET y=y+y1: LET
 s=s+1: IF s=s1 THEN GO TO misse
d ball
 420 LET b=ATTR (x+x1,y+y1)
 430 IF b=60 AND y>=29 THEN LET
y1=-1
 435 IF b=60 AND y<=17 THEN LET
y1=1
 440 IF b=60 AND x>19 THEN LET x
1=-1
 445 IF b=60 AND x<=3 THEN LET x
1=1
 450 IF b=58 THEN GO TO hit red
 460 GO TO 1200
 470 GO TO 400
 500 PRINT AT x,y; INK 1;"●": LE
T g(3)=x:: LET g(5)=y
 510 LET x2=x+x1: LET x=x2: LET
y2=y+y1: LET y=y2
 530 LET s2=s1: LET s=0
 540 PRINT AT x,y; INK 2;"●": BE
EP .09,30: PRINT AT x,y;" "
 545 PRINT AT g(3),g(5); INK 1;"
●"
 555 INK 0
 560 LET b=ATTR (x+x1,y+y1): LET
 b1=ATTR (x,y)
 570 IF b=58 THEN GO TO hit seco
nd red
 590 IF b=60 AND y<17 THEN LET y
1=1
 591 IF b=60 AND y>29 THEN LET y
1=-1
 594 IF b=60 AND x<3 THEN LET x1
=1
 595 IF b=60 AND x>19 THEN LET x
1=-1
 600 IF x=20 AND y=16 THEN GO TO
 potted ball
 602 IF x=20 AND y=30 THEN GO TO
 potted ball
 604 IF x=11 AND y=16 THEN GO TO
 potted ball
 606 IF x=11 AND y=30 THEN GO TO
 potted ball
 608 IF x=2 AND y=16 THEN GO TO
potted ball
 610 IF x=2 AND y=30 THEN GO TO
potted ball
 615 LET s=s+1
 620 LET x=x+x1: LET y=y+y1: IF
s=s2 THEN PRINT AT x,y; INK 2;"●
": IF s=s2 THEN GO TO returnball
 630 GO TO 540
 640 GO TO 550
 650 PRINT AT x,y; INK 2;"●"
 660 GO TO 620
 700 FOR n=3 TO 13: PRINT AT n,2
3; INK 1;"●": BEEP .1,n: PRINT A
T n,23;" ": NEXT n: PRINT AT 13,
23; INK 1;"●"
 710 PRINT AT 14,23; INK 0;" ";A
T 15,22; INK 0;"   ";AT 16,21; I
NK 0;"     "
 715 LET a1=0: LET b1=0
 720 FOR n=1 TO 10
 730 LET a1=INT (RND*11)+16: LET
 b1=INT (RND*16)+3: IF ATTR (b1,
a1)<>56 THEN GO TO 730
 735 BEEP .1,n
 740 PRINT AT b1,a1; INK 2;"●":
NEXT n
 760 RETURN
 800 RESTORE 800: FOR n=1 TO 17:
READ a5,b5: BEEP a5,b5: NEXT n
 810 DATA .1,9,.1,5,.1,5,.2,5,.2
,5,.1,9,.1,5,.2,7,.1,7,.1,12,.1,
12,.1,12,.2,9,.9,12,.3,7,.1,7,.5
,7
 820 LET bl=bl-1: PRINT AT 14,8;
bl;" "
 830 GO TO 310
 992 IF b=60 AND x>19 THEN LET x
1=-1
1000 PRINT AT 1,1; PAPER 1; INK
6; FLASH 1;"Missed": FOR n=0 TO
50: BEEP .1,n: NEXT n: PRINT AT
1,1;"      "
1010 LET g(5)=RND*11+16: LET g(3
)=(RND*16)+3: PRINT AT g(3),g(5)
; INK 1;"●": LET pl=pl+2
1020 PRINT AT 17,8;pl
1030 GO TO 310
1200 IF x=20 AND y=16 THEN GO TO
 potted cue
1205 IF x=20 AND y=30 THEN GO TO
 potted cue
1210 IF x=11 AND y=16 THEN GO TO
 potted cue
1215 IF x=11 AND y=30 THEN GO TO
 potted cue
1220 IF x=2 AND y=30 THEN GO TO
potted cue
1225 IF x=2 AND y=16 THEN GO TO
potted cue
1230 GO TO 470
1260 PRINT AT 1,1; PAPER 5; INK
0;"Potted Cue";AT 3,3; PAPER 5;
INK 0;"Ball"
1270 RESTORE 1275: FOR n=0 TO 35
: READ a,b: BEEP a/4,b+12: NEXT
n
1275 DATA 1,0,1,2,.5,3,.5,2,1,0,
1,0,1,2,.5,3,.5,2,1,0,1,3,1,5,2,
7,1,3,1,5,2,7,.75,7,.25,8,.5,7,.
5,5,.5,3,.5,2,1,0,.75,7,.25,8,.5
,7,.5,5,.5,3,.5,2,1,0,1,0,1,-5,2
,0,1,0,1,-5,2,0
1276 PRINT AT 1,1;"          ";A
T 3,3;"    "
1280 GO TO 1010
```

Illustration: Dorian Cross



POOL

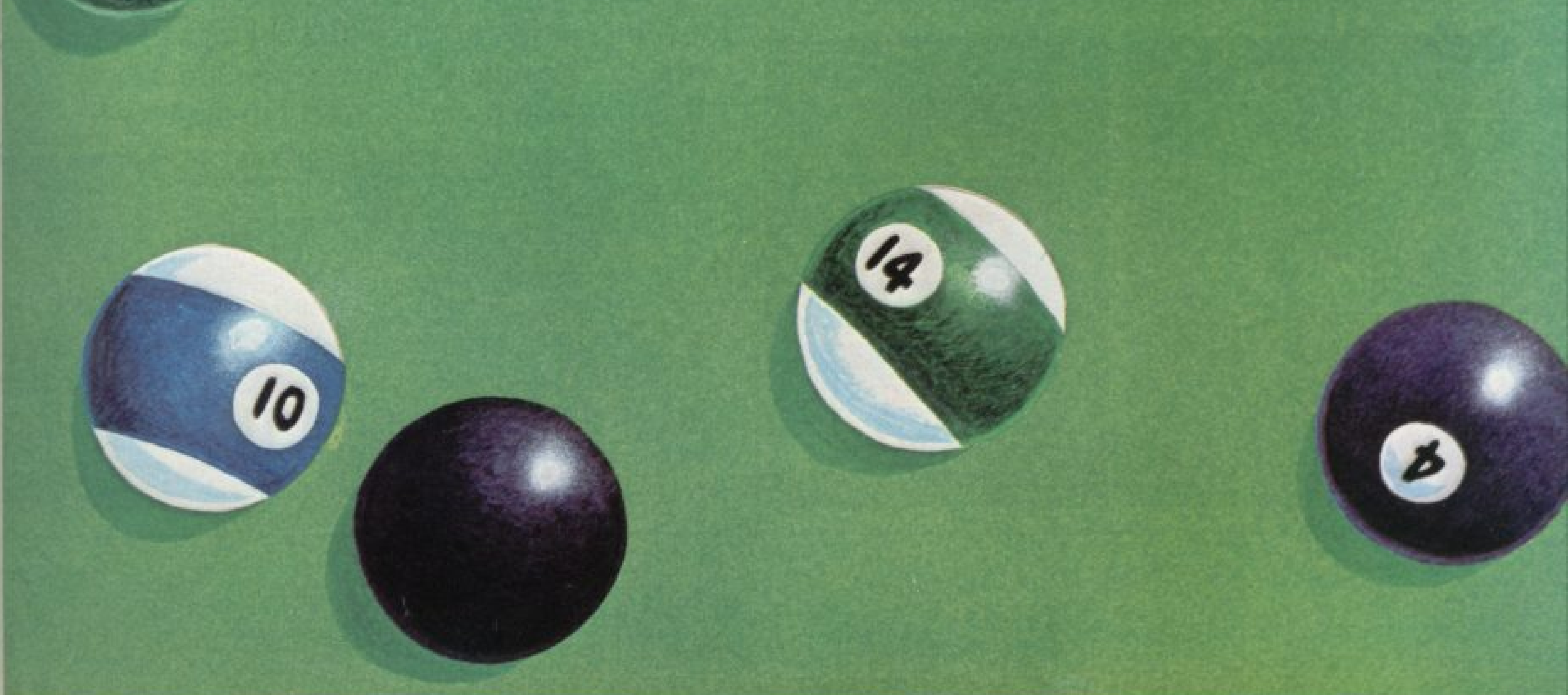
BY JOHNATHAN YEOMANS

RUNS ON A SPECTRUM IN 48K

Fancy yourself as a bit of a pool-room hustler? Well, chalk-up your cue and get ready to pot a few balls as your Spectrum sets out to sharpen-up your skills.

The computer sets the balls rolling by playing the break for you. Then you have to attempt to pot the balls by inputting the strength and direction of the cue ball. Once this is done you simply press Return and sit back and watch. Will your shot be on target? The computer keeps score throughout the game and tells you how many balls are left.

The game puts all the colour and sound facilities of the Spectrum to good use — and provides pool players with the ideal way to practice those difficult shots.



For the best hardware, the best software.

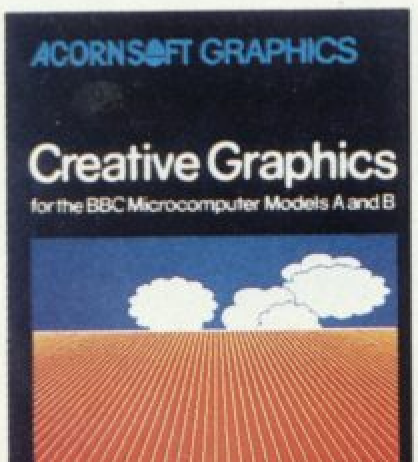
The BBC Microcomputer system is generally regarded to be the best micro in its price range you can lay your hands on. So, if you're thinking of buying one or already own one, you'll want to know about the software that's been specially designed for it.

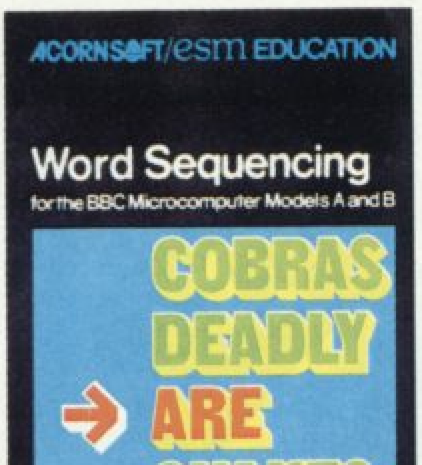
Not surprisingly, it's made by Acornsoft, the software division of Acorn Computers Ltd., who designed and built the BBC Microcomputer. So naturally you can expect the highest quality software with the built-in ingenuity to fully exploit the BBC Micro's potential.

Further education for everyone.

Creative Graphics, which includes the book 'Creative Graphics on the BBC Microcomputer' (price £17.45), provides 36 programs on cassette producing a spectacular range of pictures and patterns in full colour, including animated pictures, recursively-defined curves and three dimensional shapes.

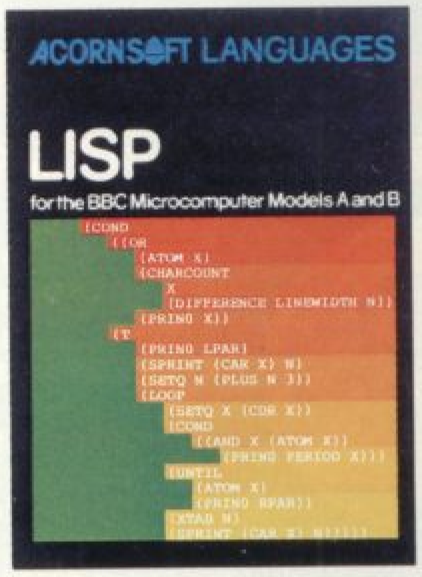
Word Sequencing (price £11.90) contains three word sequencing programs on cassette. Each program presents a series of jumbled words which must be arranged on screen to form either a proverb, nursery rhyme title or a sensible sentence.

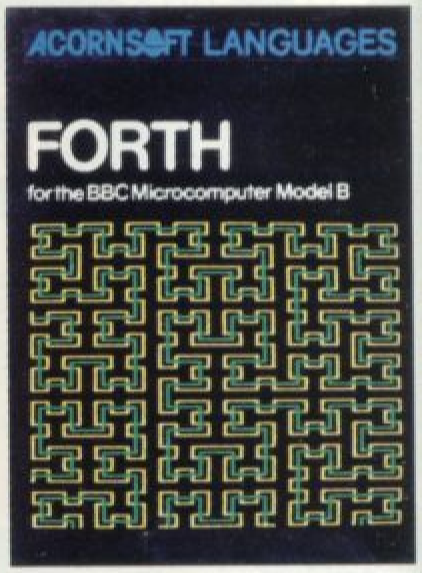




Learn more languages.

LISP (price £24.35) is the fundamental language of artificial intelligence research.



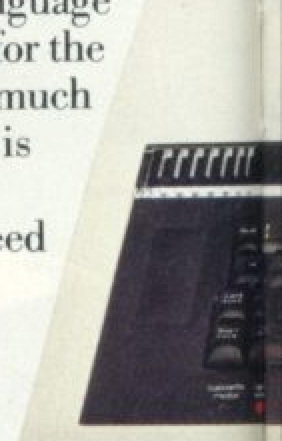


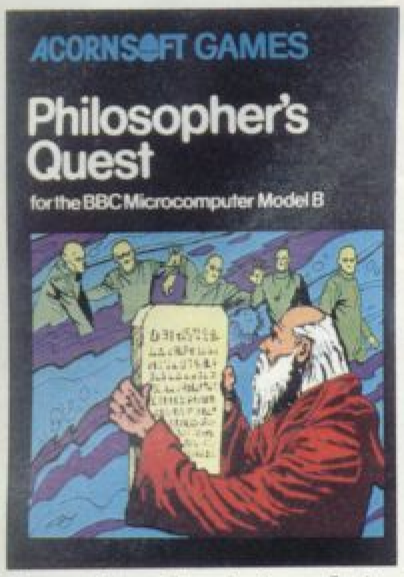
It consists of 5.5K of machine code interpreter, plus 3K of initialised LISP work-space containing utilities and constants. It comes complete with a book that introduces you to programming in LISP, as well as some fascinating applications.

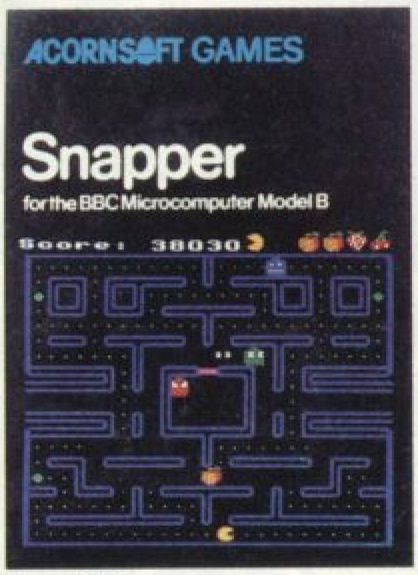
FORTH (price £24.35) is a complete implementation of the FORTH language to the 1979 standard specification for the BBC Microcomputer Model B. This much acclaimed programming language is also accompanied by a specially written book explaining all you need to know.

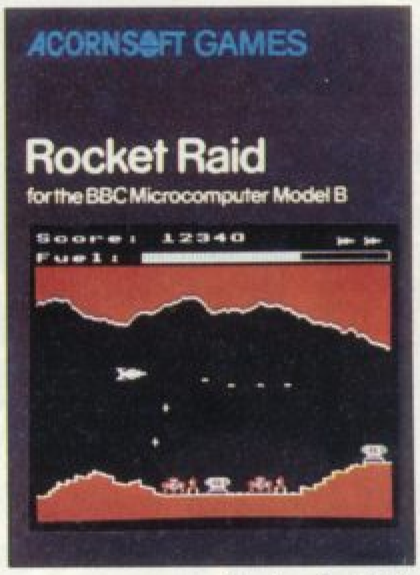
Mind-boggling games.

Philosopher's Quest (price £9.95) is an advanced adventure in which you tell the computer what you want to do and it









describes back in plain English your progress through a fascinating world of fiendish puzzles to be solved.

Snapper (price £9.95) is a colourful game where you guide your 'snapper' through the maze, eating dots and fruit and avoiding the creatures that chase you. Complete with full sound effects, score and a ladder of high scores.

Rocket Raid (price £9.95) sends you on a mission to raid a heavily guarded Martian fuel depot. You must fly your rocket over mountains and through caverns, avoiding enemy missiles and dodging convoys of deadly fizzers.

Increase your business acumen.

Desk Diary (price £9.95) is an indispensable program that can hold a file of several hundred names, addresses and telephone numbers.

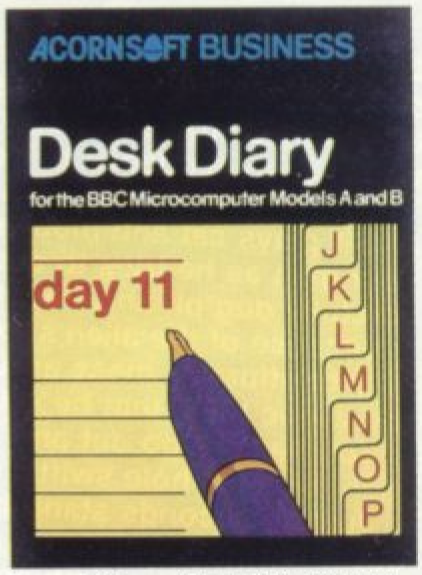
And View, a program that enables your machine, together with a printer, to operate as a fully operational word processor. (The program is in ROM, but can easily be fitted to most BBC Micros by your local dealer.) You can find out more by sending for our free catalogue.



How to get Acornsoft programs.

If you're a credit card holder and would like to buy cassettes of the programs shown in this advertisement, or if you would like to know the address of your nearest stockist, just phone 01-200 0200.

Alternatively, you can buy the cassettes directly by sending off the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Also use this form if you would like to receive the current free Acornsoft catalogue.



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FORTH	£24.35			SBL01/SBD03)
Philosphers Quest	£9.95			(SBG01)
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Rocket Raid	£9.95			(SBG05)
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ACORNSOFT

Diggers' action takes place in a dungeon of many levels. It's a fast test of wills against an alien creature with a nasty tendency to explode.

The alien resembles a flaming star and it plays cat and mouse with your man as he tries to entice it into a carefully dug pit and trap it there.

Because of the alien's explosive ability, you cannot afford to mess around hiding behind a hole in the vague hope that he will fall in.

You have to go out and tempt him to rush at you and then dig your hole swiftly while he's in full flight.

Just 30 seconds stand between you and destruction. So the game usually involves some pretty fast ladder climbing. Should you succeed in destroying the first star a second and third . . . in fact a never-ending supply is available to do battle with.

Like most of their genre, these aliens' touch is deadly to us mortals. A simplified form of Alien Panic, this game is difficult to master and so, quite addictive.



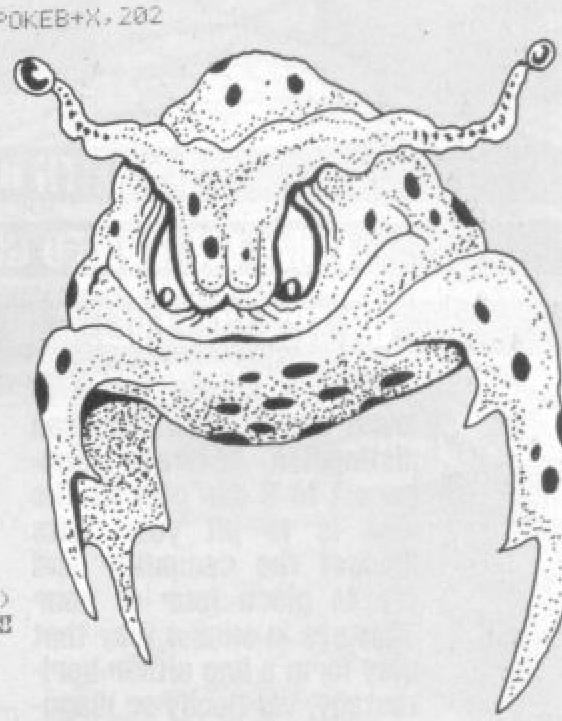
DIGGER

```
1 GOSUB800
5 REM**SET-UP**
10 PRINT"▒▒   SCORE : 00▒"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
20 PRINT"▒▒▒▒▒▒▒▒#                    #"
30 PRINT"        #                    #"
40 PRINT"        #                    #"
45 PRINT"        ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒#▒▒▒▒▒▒▒▒▒▒▒▒▒▒#▒▒▒▒"
50 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒#          #               #"
55 PRINT"              #          #               #"
60 PRINT"              #          #               #"
65 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒#▒▒▒▒▒▒▒▒#▒▒▒▒▒▒#▒▒▒▒▒▒▒▒"
70 PRINT"▒#                 #        #      #"
75 PRINT" #                 #        #      #"
80 PRINT" #                 #        #      #"
85 PRINT" #▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒#▒▒▒▒▒▒▒▒▒▒▒▒"
90 PRINT"▒▒▒▒▒▒▒▒▒#                    #"
95 PRINT"         #                     #"
100 PRINT"         #                     #"
105 PRINT"         #▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
110 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
120 A=53248+18*40:POKEA,202:B=A
121 S=53248+15*40-1:FORI=STOS-12*40STEP-160:POKEI,
    128:NEXT:TI$="000000"
125 REM***MOVE***
130 GETA$:IFA$=""THENA$=B$
```

RUNS ON A SHARP MZ80K IN 32K

BY NICK ALEXANDER

```
135 Z=Z+1:IFZ=2THENZ=0:GOTO500
140 POKEB+X,C:X=X+((A$="K")*(X<37))-((A$="J")+(X>0)):C=PEEK(B+X)
141 IFFEEK(B+X+40)=0THEN1000
142 IFA$="F"THEN400
143 IFA$="D"THEN300
144 IFA$=" "THEN200
145 POKEB+X,202
146 IFC=107THEN1000
150 B$=A$
160 IFB$="K"THENN=1
165 IFB$="J"THENN=2
166 PRINT"■■";TAB(24);"TIME:";MID$(TI$,5,2)
167 IFMID$(TI$,5,2)="15"THEN1000
170 GOTO130
195 REM***CLIMB***
200 D=PEEK(B+X+40)
205 IF(D<>163)*(C<>163)THEN145
210 IFD=163THEN260
220 FORI=1TO4:POKEB+X,163:B=B-40:POKEB+X,202:MUSIC"C1DEDC":NEXTI
225 C=0:B$="":GOTO130
260 POKEB+X,0:B=B+40:POKEB+X,202:FORI=1TO3:POKEB+X,163:B=B+40:POKEB+X,202
270 MUSIC"E1DCDE":NEXTI:C=163:B$="":GOTO130
290 REM***DIG***
300 IFN=1THEN350
310 IF(PEEK(B+X+39)<>208)+(PEEK(B+X-1)=163)THEN145
315 MUSIC"‾C1GEC"
320 POKEB+X+39,0:A$="":GOTO145
350 IF(PEEK(B+X+41)<>208)+(PEEK(B+X+1)=163)THEN145
355 MUSIC"‾C1GEC"
360 POKEB+X+41,0:A$="":GOTO145
390 REM***FILL***
400 IFN=1THEN450
410 IFPEEK(B+X+39)<>0THEN145
415 MUSIC"C1EG‾C"
420 POKEB+X+39,208:A$="":GOTO145
450 IFPEEK(B+X+41)<>0THEN145
455 MUSIC"C1EG‾C"
460 POKEB+X+41,208:A$="":GOTO145
500 IFM=1THEN550
510 XX=INT(RND(1)*38):BB=53328:M=1
520 S=INT(RND(1)*4)*160:BB=BB+S
550 POKEBB+XX,Q:IFX>XXTHENXX=XX+1
560 IFXX>XTHENXX=XX-1
565 Q=PEEK(BB+XX):QD=PEEK(BB+XX+40)
566 IFQD=0THENM=0:SC=SC+10:PRINT"■■
 SCORE :";SC:TI$="000000":GOTO670
567 IFQ=202THEN1000
568 IF(Q=163)*(BB>B)THEN640
569 IF(QD=163)*(BB<B)THEN600
570 POKEBB+XX,107:GOTO140
600 REM**DOWN**
610 POKEBB+XX,0:BB=BB+40:POKEBB+XX,107
620 FORI=1TO3:POKEBB+XX,163:BB=BB+40:POKEBB+XX,107:USR(62):NEXTI
630 Q=163:GOTO570
640 REM***UP***
650 FORI=1TO4:POKEBB+XX,163:BB=BB-40:POKEBB+XX,107:MUSIC"_C1":NEXTI:Q=0
660 GOTO570
670 FORI=1TO3:MUSIC"‾C0#BB#AA#GG#FF#EE#DD#CC":NEXT:GOTO140
800 PRINT"■■■■■■■┏━┓╻┏━┓┏━┓┏━┓"
802 PRINT"■■■■■■┃ ┃┃┃  ┃  ┃ ┃"
804 PRINT"■■■■■■┃ ┃┃┃ ┓┃ ┓┣━┛"
805 PRINT"■■■■■■┗━┛╹┗━┛┗━┛╹ ╹"
806 FORI=1TO1000:NEXT:TEMPO7
810 FORI=1TO6:POKE53380+(I*40),163:FORI1=1TO200:NEXT:MUSIC"C0":NEXT
815 FORI=1TO15:POKE53655+I,208:FORI1=1TO200:NEXT:MUSIC"‾C0":NEXT:POKE53628,202
817 FORI=1TO6:POKE53380+(I*40),107:MUSIC"F0":FORI1=1TO500:NEXT
818 POKE53380+(I*40),163:NEXT
819 FORI=1TO6:POKE53621+I,107:FORI1=1TO400:NEXT:MUSIC"‾F0":IFI=4THENI4=1
820 IFI4=1THENPOKE53667,0:PRINT"■■■";TAB(18);"+DIG*":I4=0
825 POKE53621+I,0:NEXT
826 FORI=1TO5
830 FORI=1TO7:MUSIC"‾C0#BB#AA#GG#FF#EE#DD#CC":NEXT:PRINT"■■■■■■■■■■SCORE10"
840 PRINTTAB(10);"■■■■━━━━━━━━━━ ":FORI=1TO600:NEXT:USR(62)
850 PRINTTAB(10);"┃THE  GAME┃ ":FORI=1TO600:NEXT:USR(62)
855 PRINTTAB(10);"━━━━━━━━━━ ":FORI=1TO600:NEXT:USR(62)
900 PRINT"The game is set in a dungeon.The object is to destroy the flaming";
905 PRINT" star before it explodes.There is a 15 second limit before the ";
910 PRINT" star explodes.To destroy the star you must dig a hole and lure";
915 PRINT" the star to fall and die.It follows you and if it actually ";
920 PRINT" touches you,instant death folows."
925 PRINT"■■■■■PRESS ANY KEY"
930 GETD$:IFD$=""THEN930
940 PRINT"■";TAB(15);"■┏━━━━━━━━━━┓ ":FORI=1TO600:NEXT:USR(62)
950 PRINTTAB(15);"┃ CONTROLS ┃":FORI=1TO600:NEXT:USR(62)
955 PRINTTAB(15);"┗━━━━━━━━━━┛ ":FORI=1TO600:NEXT:USR(62)
960 PRINT"■";TAB(17);"J←";CHR$(99);"→K"
965 PRINT"■";TAB(17);"D-DIG":USR(62):PRINT"■";TAB(17);"F-FILL":USR(62)
966 PRINT"■";TAB(17);"SPACE-UP&DOWN":USR(62)
970 PRINT"■■■■■■PRESS ANY KEY TO PLAY"
980 GETD$:IFD$=""THEN980
990 RETURN
1000 FORI=1TO1000:NEXT:TEMPO7:MUSIC"C4EG‾CGEC_G_E_C":FORI=1TO1000:NEXT
1005 PRINT"■■■SCORE";SC:PRINT"■Do you want another gameY/N"
1010 GETF$:IFF$=""THEN1010
1020 IFF$="Y"THENCLR:GOTO5
```



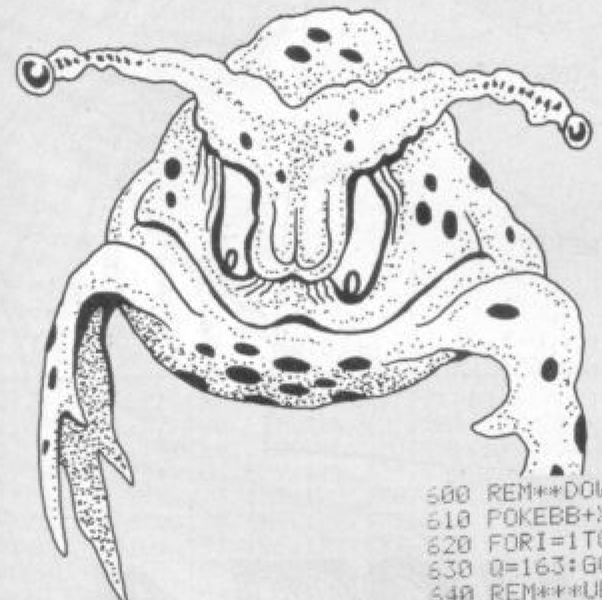
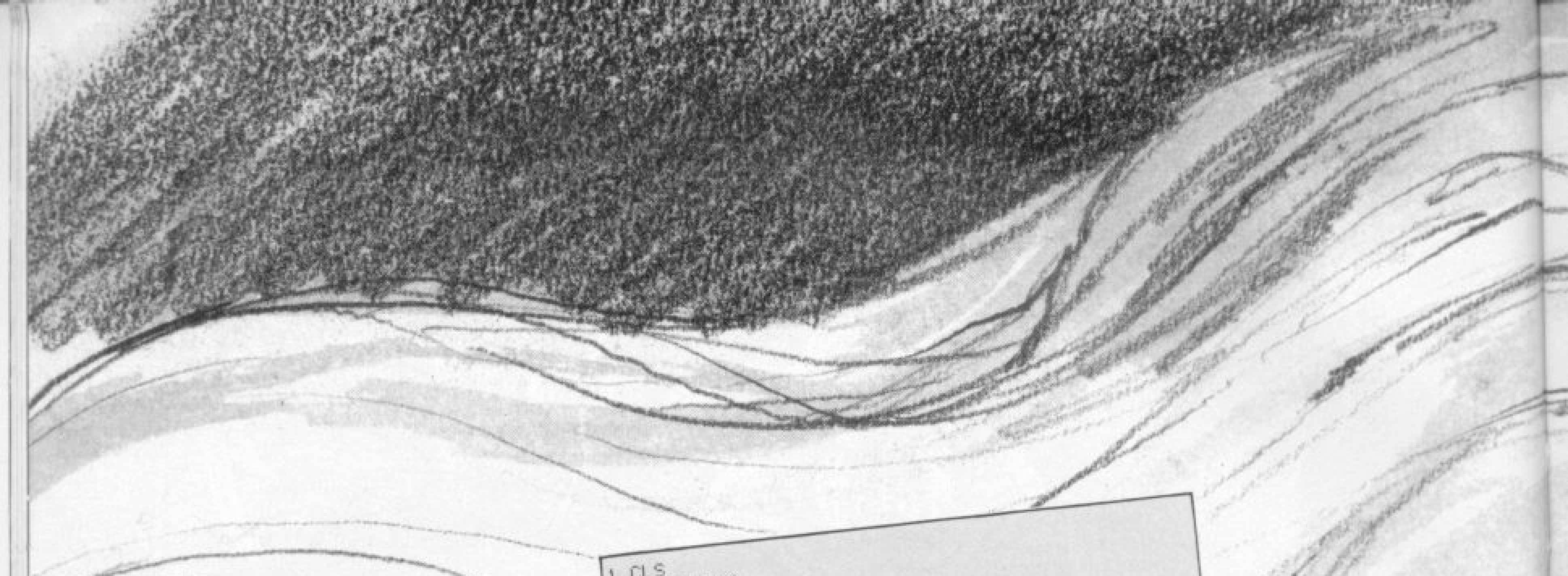


Illustration: Dorian Cross



BY KEITH HOOK

RUNS ON A VIDEO GENIE OR TRS-80 LEVEL II IN 16K

```
1 CLS
10 GOTO1500
50 CLS:GOSUB2500
51 GOSUB5000
60 O$=H$:IFX$=H$THENO$=C$
65 Y=1:YY=0:S=0:GOSUB200
70 Y=1:YY=1:GOSUB200
75 Y=0:YY=1:GOSUB200
80 Y=-1:YY=1:GOSUB200
85 RETURN
200 XX=1:A=1:Q=0:S=S+1
201 M=0
210 FORI=1TO3:H=X+I*YY:N=R+I*Y
220 IFH<1 OR N<1 OR H>8 OR N>8THEN280
230 G$=G$(N,H):IFM=0THEN260
240 IFG$=O$THENI=4:GOTO280
250 Q=Q+1:GOTO280
260 IFG$=X$THENA=A+1:GOTO280
270 M=1:GOTO240
280 NEXTI
290 IFXX=0THENA(S)=A:K(S)=Q:RETURN
300 XX=0:YY=-YY:Y=-Y:GOTO201
1499 'INITIALISE
1500 CLEAR1500:
1505 CLS:DEFINTA,B,C,D,H,I,J-T,V-Z
1510 DIMG$(8,8),A(4),R(8),K(4),J(4),G(16),GC(8,8)
1515 'FORINIT OF SOUND
1516 FORJJ=16478TO16500
1517 READLL:POKEJJ,LL:NEXTJJ
```

This is a simple game to learn and anyone who can distinguish between numbers 1 to 8 can play it! The idea is to pit your wits against the computer and try to place four of your markers in such a way that they form a line either horizontally, vertically or diagonally.

This version contains a sound routine that is poked into memory and converted to machine language.

There is no need to protect any memory when you run the game as I have used 16478 onwards which is not used by the interpreter after power up. This saves memory as this location resides within the part of memory that is normally saved by the Basic Interpreter.

A point to note is that any short language subroutine can be poked here.

If you don't require sound delete lines 1515 through to 1519 then delete all the V=USR() calls.

To use this sound routine you must have the Video Genie conversion kit installed or through the external cassette socket by taking the plug which normally fits into the auxiliary socket of the recorder and reconnecting it to an external amplifier. Tandy TRS-80 users should have no problem.

CONNECT 4

```
1518 DATA205,127,10,76,69,62,1,211,255,16,254,69,62,2,211,255,16,254,13,194,98,6
4,201
1519 POKE16526,94:POKE16527,64
1540 PRINT@521,"############   CONNECT  FOUR   ############"
1545 PRINT:PRINTTAB(11)"BASED ON MILTON BRADLEY'S CONNECT FOUR"
1546 FORI=1TO2000:NEXT
1550 FORI=1TO16:READG(I):NEXTI
1555 DATA2,120,505,1E22,1,880,4500,1E30,1,80,1000,1E16,2,500,3050,1E18
1560 H$=CHR$(137)+CHR$(143)+CHR$(134)
1565 C$=CHR$(143)+CHR$(143)+CHR$(143)
1570 CLS:PRINT:PRINT"DO YOU NEED INSTRUCTIONS";
1575 IN$=INKEY$
1580 IF IN$="Y"THENV=USR(9000):GOTO4000
1585 IFIN$="N"THENV=USR(32100):GOTO50
1590 GOTO1575
2499 ' PRINT BOARD
2500 GR$="            64 SPACES                                   "
2510 DATA32,32,32,32,32,32,32,191,128,45,45,45,128,191,128,45,45,45,128,191,128,
45,45,45,128,191,128,45,45,45,128,191,128,45,45,45,128,191,128,45,45,45,128,191,
128,45,45,45,128,191,128,45,45,45,128,191,32,32,32,32,32,32,32,32
2530 Q=VARPTR(GR$)
2540 P=PEEK(Q+2)*256+PEEK(Q+1)
2550 FORI=PTOP+63
2560 READGR
2570 POKEI,GR
2580 NEXTI
2590 FORI=192TO640STEP64
2591 PRINT@I,GR$:NEXTI
2600 FORI=16071TO16119
2610 READGR
2620 POKEI,GR:NEXT
2630 FORI=16135TO16183
2640 READGR
2650 POKEI,GR:NEXTI
2660 FORI=16199TO16205
2670 READGR
2680 POKEI,GR:NEXTI
2690 FORI=16242TO16247
2700 READGR
2710 POKEI,GR:NEXTI
2715 FORI=16263TO16311
2716 READGR
2717 POKEI,GR:NEXT
```



```
2720 DATA191,191,191,49,170,191,191,191,191,50,170,191,191,191,191,51,170,191,19
1,191,191,52,170,191,191,191,191,53,170,191,191,191,191,54,170,191,191,191,191,5
5,170,191,191,191,191,56,170,191,191,191
2730 DATA191,183,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179
,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179,179
,179,179,179,179,179,179,179,187,191,191
2740 DATA191,191,191,191,159,135,128
2750 DATA139,175,191,191,191,191
2760 DATA189,159,135,129,128,128,128,128,128,128,128,128,128,42,42,128,128,67,79
,78,78,69,67,84,128,128,128,128,70,79,85,82,128,128,42,42,128,128,128,128,128,12
8,128,128,128,130,139,175,190
2770 FORI=8TO1STEP-1:FORJ=1TO8
2771 READGC(I,J)
2772 NEXTJ:NEXTI
2775 DATA201,207,213,219,225,231,237,243,265,271,277,283,289,295,301,307,329,335
,341,347,353,359,365,371,393,399,405,411,417,423,429,435,457,463,469,475,481,487
,493,499,521,527,533,539,545,551,557,563,585,591,597,603,609,615,621,627,649,655,
 661,667,673,679,685
2780 DATA691
2781 FORI=15378TO15405
2783 READJI:POKEI,JI:NEXTI
2785 DATA35,32,67,79,77,80,85,84,69,82,32,65,78,68,32,86,73,68,69
2787 DATA79,32,71,65,77,69,83,32,35
2789 RETURN
4000 CLS:PRINTTAB(19)"CONNECT  FOUR"
4010 PRINT:PRINT"THE GAME CONSISTS OF PLACING
";H$;" ON THE BOARD WITH THE"
4020 PRINT"INTENTION OF TRYING TO GET FOUR OF YOUR MARKERS IN A ROW"
4030 PRINT"       VERTICALLY,HORIZONTALLY, OR DIAGONALLY."
4040 PRINT:PRINT"THE COMPUTER WILL PLAY ";C$;" AND WILL TRY TO OUT-WIT";
4050 PRINT" YOU !!!"
4060 PRINT"THE COMPUTER PLAYS A GOOD GAME .... SO... WATCH OUT."
4070 PRINT:PRINT"NOW PRESS ANY KEY TO CONTINUE..."
4080 IF INKEY$=""THEN4080ELSE50
4999 'HUMAN MOVE
5000 PRINT@960,"DO YOU WANT TO GO FIRST ?";
5010 IN$=INKEY$
5020 IFIN$="N" THENV=USR(8090):GOTO6000
5030 IFIN$=""THEN5010
5031 V=USR(31999)
5040 PRINT@960,CHR$(30);
5050 POKE16537,0
5060 PRINT@960,"PICK A NUMBER BETWEEN 1 & 8";
5070 IN$=INKEY$
5071 IFIN$=""THEN5070
5080 X=VAL(IN$)
5090 X=INT(X)
5100 IFX>=1 AND X<=8 GOTO5130
5110 PRINT@960,CHR$(30);
```

Illustration: Jon Davis

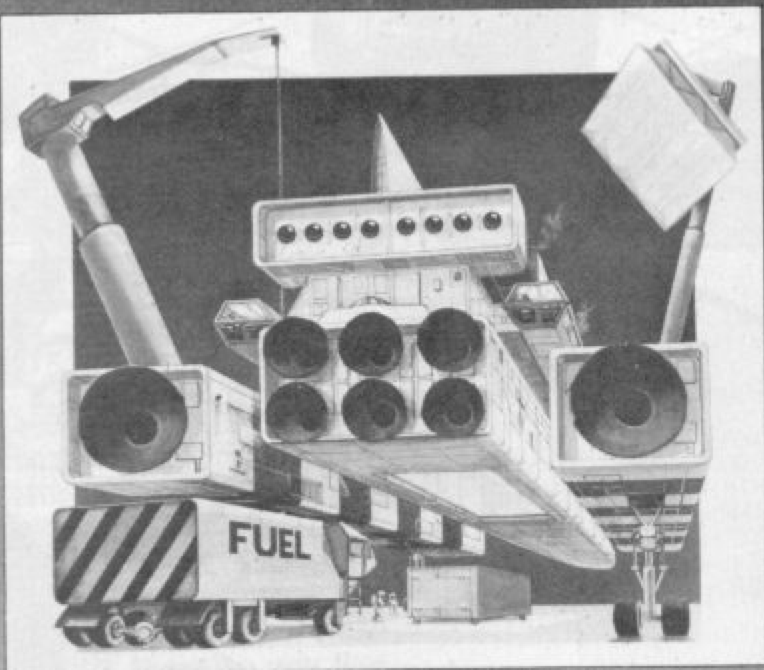
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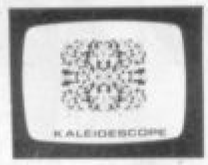
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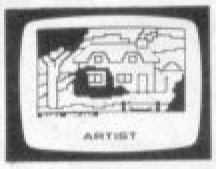
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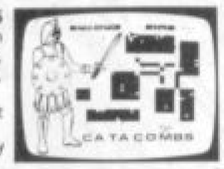
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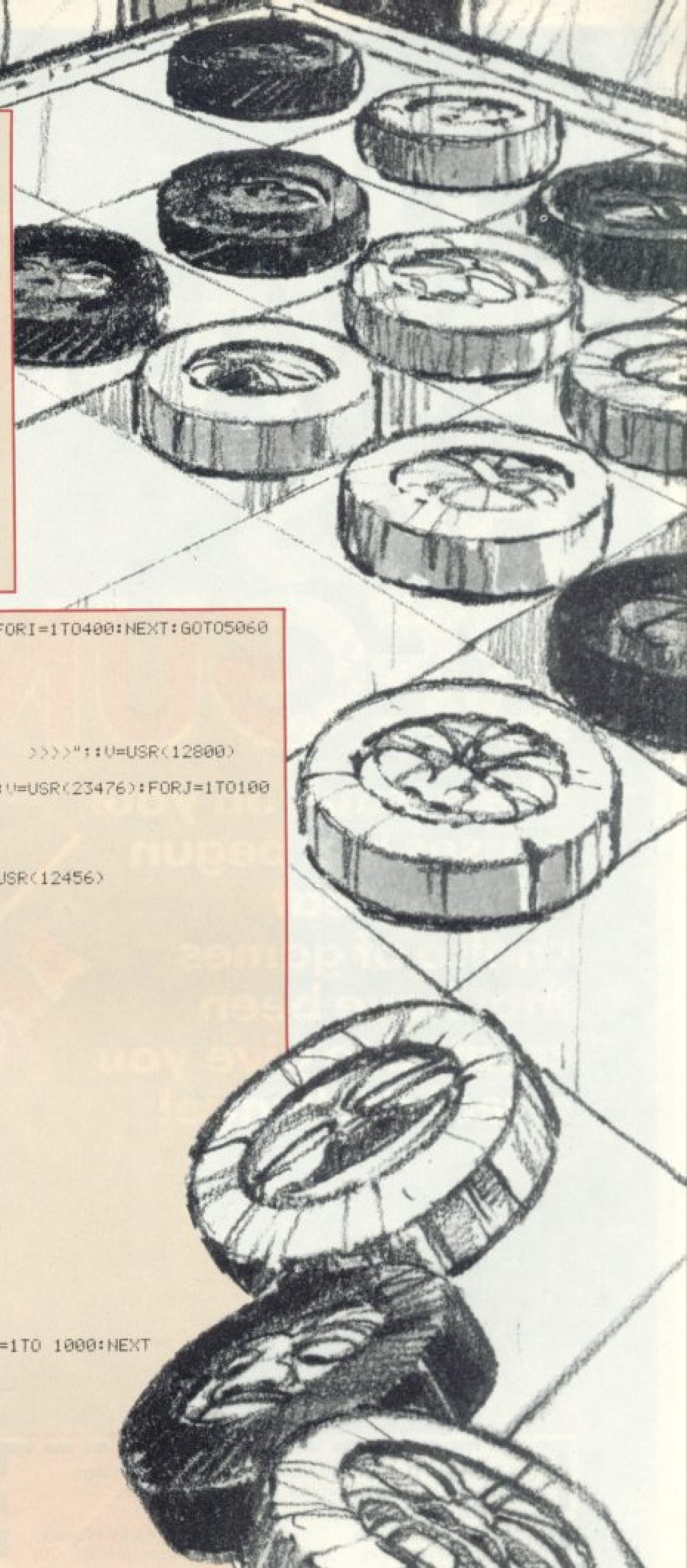
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Program notes:
Lines 2500-2580: Contain a dummy string GRS and the spaces between the quotation marks must add up to 64. This short routine is used to convert the dummy string and fill it with graphic characters that are then used to PRINT@; rather than poke or set, and is far quicker.

Also, no CLEAR statement is required for this string and does not need to be taken into account at the beginning of the programme.

Control: If you want to experiment with the computer's game try changing the first six values in line 1555. Lines 1560-1565 contain the graphic strings for human player and the computer. CHRS (30) clears the print line instead of using 'PRINT@XX, STRINGS(X,""). which seems a rather long-winded way of doing things.

The computer takes anything from 10 secs to 1 min to think about its move, especially at the beginning of the game because it has to calculate each position in the GS (8,8) array.

```
5120 PRINT@960,"SORRY !! ILLEGAL INPUT.";:V=USR(32000):FORI=1TO400:NEXT:GOTO5060

5130 R=R(X):IFR>7THEN5110
5131 V=USR(31900)
5140 R(X)=R+1:R=R+1:G$(R,X)=H$:CR=GC(R,X):GOSUB 9000
5150 X$=H$::GOSUB60
5160 FORD=1TO4:IFA(D)<4THENGOTO5190ELSED=4
5170 FORI=1TO6:PRINT@960,"<<<<   O.K    YOU   WIN  !!!    >>>>";:V=USR(12800)
5180 FORJ=1TO150:NEXT
5181 PRINT@960,"<<<<                                        >>>>";:V=USR(23476):FORJ=1TO100
:NEXTJ,I
5182 GOTO10000
5190 NEXTD
5199 'COMPUTER MOVE
6000 P6=0:PRINT@960,CHR$(30);:PRINT@960,"THINKING ";:A=USR(12456)
6010 U=0:J=1
6020 FOR P=1TO8:R=R(P)+1
6030 IFR>8THEN 6181
6040 E=1:X$=C$:F=0:X=P
6045 GOSUB60
6050 FORL=1TO4:J(L)=0:NEXTL
6060 FORI=1TO4:A=A(I):IFA-F>3 I=4:GOTO7010
6070 Q=A+K(I):IFQ<4THEN 6090
6080 E=E+4:J(A)=J(A)+1
6090 NEXTI
6100 FORI=1TO4:W=J(I)-1:IFW=-1THEN 6130
6110 Z=8*F+4*SGN(W)+I
6120 E=E+G(Z)+W*G(8*F+I)
6130 NEXTI
6140 IF F=1 THEN 6155
6150 F=1:X$=H$:GOTO6045
6155 R=R+1:IFR>8THEN 6170
6160 GOSUB60
6165 FORI=1TO4:IFA(I)>3THENE=2:NEXTI
6170 IFE<UTHEN 6181
6171 IFE>UTHENO=1:GOTO6180
6175 O=O+1:IF RND(0)>1/O THEN 6181
6180 U=E:P6=P
6181 NEXTP
6185 IF P6<>0THEN 6200    ELSE PRINT@960,CHR$(30);
6190 PRINT@960,"** ITS  A  DRAW **";:V=USR(23199):FOR I=1TO 1000:NEXT
6195 GOTO 10000
6200 X=P6
7000 PRINT@960,CHR$(30);
7010 PRINT@960,"I AM GOING IN COLUMN ";X;:V=USR(6012)
7020 FORI=1TO1000:NEXT
7030 R=R(X)+1:R(X)=R(X)+1
7040 G$(R,X)=C$
7050 X$=C$
7055 CR=GC(R,X):GOSUB9000
7058 GOSUB60
7060 FORI=1TO4:IFA(I)<4THEN NEXTI :GOTO5040
7061 I=4
7065 PRINT@960,CHR$(30);
7070 FORI=1TO8:PRINT@960,"<<<< SORRY  i  WIN  >>>>";:V=USR(8618)
7075 FORJ=1TO200:NEXTJ
7080 PRINT@960,"< <     HA!  HA!    > > ";:V=USR(31440):FORJ=1TQ200:NEXTJ,I
7090 GOTO10000
8000 NEXTI
9000 IFG$(R,X)=H$THEN F$=H$
9010 IFG$(R,X)=C$ THEN F$=C$
9020 PRINT@CR,F$;:IFF$=H$THENV=USR(256*70+150)ELSEV=USR(256*10+120)
9030 RETURN
10000 PRINT@960,CHR$(30);
10010 PRINT@960,"DO YOU WANT TO PLAY AGAIN ?"
10020 IN$=INKEY$
10030 IF IN$=""THEN10020
10040 IFIN$="N"THEN V=USR(8900):END
10050 V=USR(7000):V=USR(32000):RUN
```



...e fastest, meanest,
...m up g... wave of the most
...Wave...
...eadly ali... your space
...ally town...
...deadly ...al Plasma Disruptors and
...ou have ...
...hrust D... haven't you?
...X SPECTRUM (16K or 48K)
100% machine code with 12 different alien types,
incredible animation and explosive effects, sound and the
fastest, smoothest hi-res graphics ever!
VIC-20 (any memory size)
100% machine code with eight different alien types,
smooth hi-res multicolour graphics and animation, narrow
playfield and sensational sound effects.
Keyboard or joystick.
Game design and software by D. H. Lawson.
for any ZX SPECTRUM.
It's my own fault, I even volunteered.
I thought that with the space-dozer and its shovel and skyhook
it would be easy shifting the galaxy's rubbish.
Childs play. HUH! They warned me of the weird packaging,
the trays, the rods, and all the rest.
But they didn't say I'd have to stop and control not just one but two
or even more garbage pods. Then prod them, push
them, toward that black hole, and oh, it's so very, very
black, and so lonely, so empty.
Panic, mustn't panic, but they won't stop, twirling and
spinning and turning, always turning, towards me, against
me, at me. And I'm alone.
No way out, nowhere to hide, on my own, my own... own.
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the Yid Kids. (D.H.L.)
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dart from elevator to elevator, coz if the Boss
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WACKY WAITERS
Imagine
..the name
of the game



Illustrations: Jon Davis

LISTING 1

```
10 REM  DOCTOR WHO ADVENTURE
         INSTRUCTIONS
20 DATA 28,8,28,62,93,28,20,20
30 DATA 0,0,0,224,191,226,5,0
40 DATA 0,0,0,64,255,64,0,0
50 DATA 0,0,0,64,160,64,0,0
60 DATA 0,0,0,224,160,224,16,0
70 DATA 0,0,64,112,128,0,0,0
80 DATA 0,0,32,80,248,0,0,0
90 DATA 8,8,93,62,28,28,20,20
100 DATA 0,224,32,32,38,36,36,60
110 DATA 0,0,64,196,60,60,68,0
120 DATA 0,127,127,127,0,247,247,247
130 DATA 192,216,216,216,24,216,216,216
140 DATA 3,27,27,27,24,27,27,27
150 DATA 255,255,255,255,255,255,255,255
160 DATA 3,6,12,24,48,96,192,128
170 DATA 126,98,102,106,114,98,98,126
180 DATA 24,56,24,24,24,24,60,126
190 DATA 126,98,6,60,96,96,102,126
200 DATA 126,102,6,28,6,6,102,126
210 DATA 124,100,100,100,126,12,12,12
220 DATA 126,64,64,124,6,102,102,60
230 DATA 60,102,96,124,102,102,102,60
240 DATA 126,98,98,12,24,24,24,24
250 DATA 60,102,102,60,102,102,102,60
260 DATA 62,98,98,98,62,6,6,6
270 DATA 240,240,240,240,240,240,240,240
280 DATA 15,15,15,15,15,15,15,15
290 DATA 24,60,126,126,60,60,126,126
300 DATA 0,0,126,0,0,126,0,0
310 DATA 96,48,24,12,24,48,96,0
320 DATA 126,102,6,30,24,24,0,24
330 DATA 60,90,165,195,195,165,90,60
340 DATA 0,60,102,102,126,102,102,0
350 DATA 0,124,102,124,102,102,124,0
360 DATA 0,60,102,96,96,102,60,0
370 DATA 0,124,54,50,50,54,124,0
380 DATA 0,126,96,120,96,102,126,0
390 DATA 0,126,54,48,124,48,48,0
400 DATA 0,62,102,96,110,98,60,0
410 DATA 0,102,102,126,102,102,102,0
420 DATA 0,126,24,24,24,24,126,0
430 DATA 0,126,12,12,76,108,56,0
440 DATA 0,102,108,120,108,102,102,0
450 DATA 0,48,48,48,48,114,126,0
460 DATA 0,99,119,127,107,99,99,0
470 DATA 0,102,118,126,110,102,102,0
480 DATA 0,60,102,102,102,102,60,0
490 DATA 0,124,54,54,124,48,48,0
500 DATA 0,60,98,98,106,100,58,0
510 DATA 0,124,54,54,124,54,54,0
520 DATA 0,62,96,60,6,102,60,0
530 DATA 0,126,90,24,24,24,24,0
540 DATA 0,102,102,102,102,102,60,0
550 DATA 0,102,102,102,102,52,24,0
560 DATA 0,98,98,106,126,118,102,0
570 DATA 0,102,102,28,56,102,102,0
580 DATA 0,102,102,62,6,102,60,0
590 DATA 0,126,12,24,48,102,126,0
600 DATA 0,112,96,96,96,96,112,0
610 DATA 192,96,48,24,12,6,3,1
620 DATA 0,30,6,6,6,6,30,0
630 DATA 60,126,255,255,255,255,255,255
640 DATA 0,0,3,60,192,0,0,0
900 FOR T=0 TO 503:READ A:POKE 14856+T,A
:NEXT T
1000 GRAPHICS 17:POKE 756,58:POKE 708,20
:POKE 709,198:POKE 710,148:POKE 711,55:P
OKE 712,26:POKE 752,1
1010 ? #6:? #6;"++++++++++++++++++++DocT
Or wHO adVEntURe++++++++++++++++++++";
1020 ? #6;",i-";CHR$(129);"+++++++DOCTOR
,i-";
1030 ? #6;",N-";CHR$(2);"++++++++++KEY,N
-";
1040 ? #6;",S-";CHR$(3);"++++++++SWORD,S
-";
1050 ? #6;",t-";CHR$(4);"+++++++++RING,t
-";
1060 ? #6;",r-";CHR$(5);"+++++++++ROPE,r
-";
1070 ? #6;",U-";CHR$(6);"++++++RAY GUN,U
-";
1080 ? #6;",C-";CHR$(7);"+++TIME DRIVE,C
-";
1090 ? #6;",t-";CHR$(60);"+++MUMMY CASE,
t-";
1100 ? #6;",i-";CHR$(40);"++++++++MUMMY,
i-";
1110 ? #6;",O-";CHR$(137);"++++++++SNAKE
,O-";
1120.? #6;",N-";CHR$(42);"+++++++SPHINX,
N-";
1130 ? #6;",s-";CHR$(161);"+++++++MASTER
,s-";
1140 ? #6;"++++++++++++++++++++By jERemY
 GugGEnhEIm";
1150 ? #6;"++++++++++++++++++++LoaDIng M
Ain PRogRAm++++++++++++++++++++"
2000 POKE 764,12:CLOAD
```

RUNS ON AN ATARI 400/800 IN 16K WITH JOYSTICK

Dr Who Adventure

BY JEREMY GUGGENHIEM

Another time, another place . . . the Doctor is on the move again and this time you can become one of his travelling companions.

This graphics adventure is based on the classic sci-fi TV series Dr Who. In it the good Doctor is trapped on the planet Strardos IV in a pyramid built by his arch-enemy, the Master.

The Master plans to destroy the planet — and the Doctor — with a time bomb. He has stolen the Doctor's time drive unit from the Tardis — and without this the Doctor cannot escape the doomed planet. He must get it back — but he can only do this by killing the Master.

You take the role of the Doctor — everything else is controlled by the computer. There are 12 rooms within the pyramid which you must explore in your attempt to escape.

Some of the rooms contain things you will need to escape — some contain hazards which you must overcome.

Objects you need are hidden in mummy cases — but be careful, some of the cases contain angry mummies who do not want to be disturbed! The position of mummies and mummy cases differs each time you play the game.

You can drop an object you are carrying in an empty room by pressing the fire button on the joystick which you also use to control your movements. These objects are replaced in mummy cases when you leave the room.

The time left before the bomb explodes and the number of the room you are in are shown at the bottom of the screen.

Objects you will need in your escape bid are the key to the Master's Tardis, which is contained in a mummy case somewhere in the pyramid; a sword from the High Priest's temple which will protect you against snakes and the Sphinx; a magic ring, which protects you against any stray thunderbolts; a rope, which will come in useful if you fall into any pits; a ray gun, which you will find in a pit, and your time drive which is in the Master's Tardis.

Deadly dangers which you must avoid or defeat if you are to survive include mummies and snakes. And don't leave the key in the Master's Tardis — you'll never get back in!

LOADING AND CLOADING

Because this program includes instructions which are shown while the other program is loading the loading and saving procedures are slightly different from normal. To load the program type: RUN "C:" (and press RETURN)

The program will load and when ready will say "READY". You should then type "RUN" and the program will run.

To save the instruction program either load it off the tape by typing "CLOAD" instead of "RUN"C:"" and when it is ready type "SAVE"C:"", or write out the listing and type "SAVE "C:"".

When the instructions have been saved (using SAVE "C:") you can save the main program. You do this by either writing out the listing of loading the program from tape and then, DIRECTLY after the instruction program, you CSAVE the program in the normal way.

Now, when you RUN"C:" the instruction program, the program will immediately run without having to type anything. Then line 2000 tells the computer to load the main program will still keeping the instructions on the screen.

There are two main advantages of having the two different programs. The first is that the instructions can be read in plenty of time while you are waiting for the main program to load.

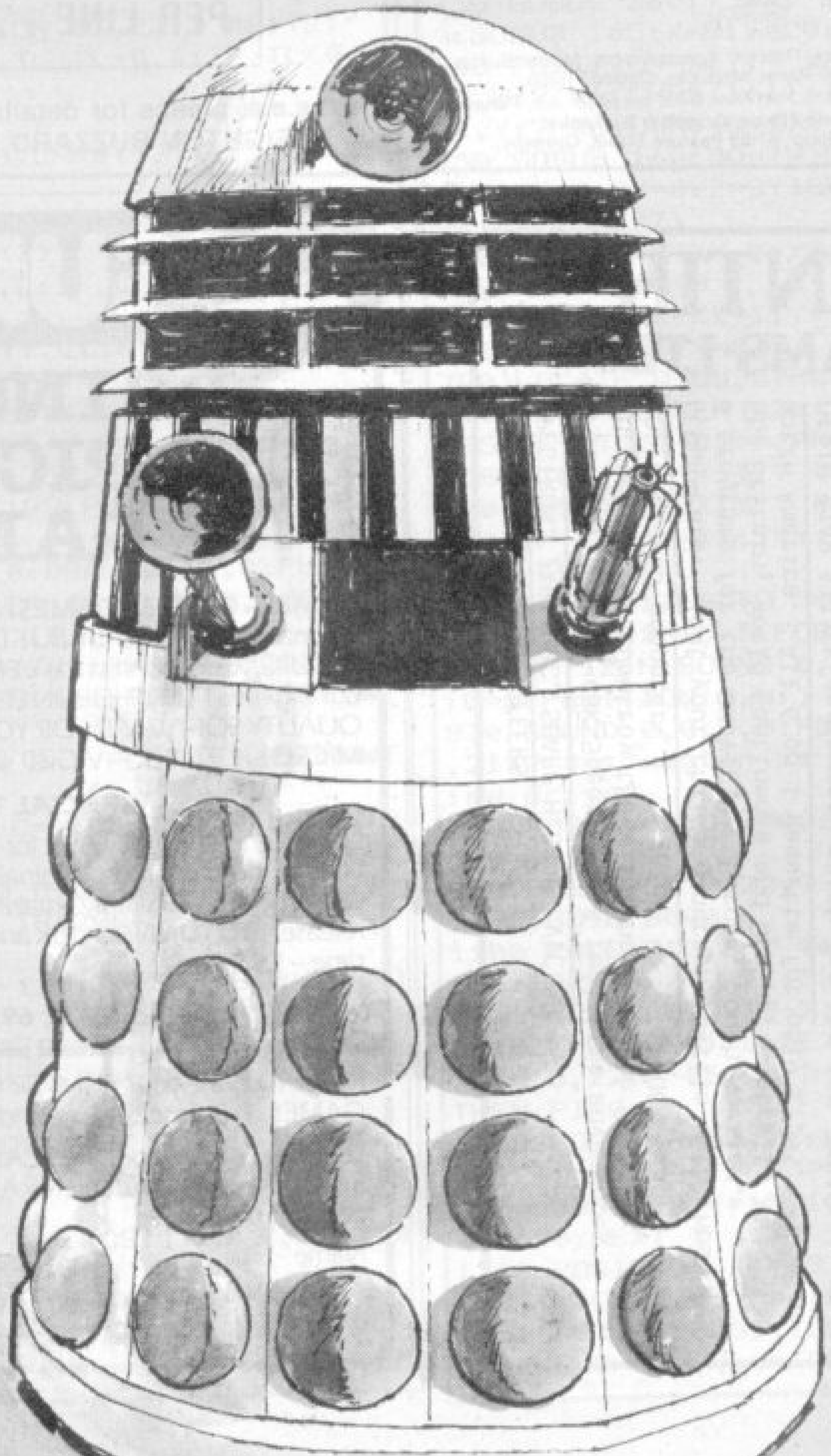
The second is that this method saves about 8 K of memory and a lot of time. This is because it creates a whole new custom character set before printing the instructions. The new set is kept in memory will you load the new program (even NEW does not affect it).

The memory used for the character set and instructions is cleared when the other program loads but the character set stays intact. Also the immensely tedious time it takes to build a new set is forgotten as this is done automatically when the instructions load.

However, there is a problem with the program, and this is that after 15-50 games (depending on their length) the character generation starts to get over written by RAM.

This seems impossible to solve. There may be a way but I do not know one perhaps someone out there can solve it?.

The character set RAM is held as high up in memory as I can get it without upsetting the Display List. The only thing to do when this happens is to re-load the whole program.



LISTING 2

```
5 CLR
10 DIM R(12),D(12),X(15),Y(15)
56 DATA 110,0,1110,0,1010,0,1000,1,101,5
,111,0,1110
60 DATA 0,1000,4,1,2,1,7,11,6,1000,8,1,1
,1,-1,1,0,0,0,-1,1,-1,-1,-1,0,0,0,0,1,0,
-1,0,0
80 FOR N=1 TO 12:READ A,B:D(N)=A:R(N)=B:
NEXT N:FOR N=5 TO 15:READ A,B:X(N)=A:Y(N
)=B:NEXT N
90 TL=30:X=9:Y=16:YR=4:O=0:SN=1:SL=1:PI=
1:MT=0:FOR T=1 TO 4:GOSUB 95:READ A:R(I)
=A:NEXT T:GOTO 300
95 I=INT(RND(0)*7)+1:IF R(I)=0 THEN RETU
RN
96 GOTO 95:DATA 10,11,14,15
100 POSITION 0,22:? #6;"doctor who adven
ture    TIME LEFT=":RETURN
105 POSITION 19,22:? #6;"      TIME LEFT="
:RETURN
110 IF A AND Y=0 THEN YR=YR-1:Y=20:GOTO
300
120 IF B AND X=18 THEN YR=YR+4:X=1:GOTO
300
130 IF C AND Y=21 THEN YR=YR+1:Y=1:GOTO
300
140 IF D AND X=0 THEN YR=YR-4:X=17:GOTO
300
150 RETURN
160 TL=TL-0.01:POSITION 13,23:? #6;TL;"
":IF TL=INT(TL) THEN TL=TL-0.4:IF TL<0.0
1 THEN 8000
170 RETURN
180 POSITION X,Y:? #6;CHR$(129);:IF O TH
EN ? #6;CHR$(O+1)
190 GOSUB 160:XX=0:YY=0:Z=STICK(0):IF Z<
15 THEN XX=X(Z):YY=Y(Z)
200 LOCATE X+XX,Y+YY,L:IF L>42 AND L<47
THEN XX=0:YY=0
210 LOCATE X+XX+1,Y+YY,L:IF L>42 AND L<4
7 THEN XX=0:YY=0
220 POSITION X,Y:? #6;"  ":X=X+XX:Y=Y+YY
:RETURN
300 GRAPHICS 17:POKE 752,1:POKE 712,26:P
OKE 708,19:POKE 709,199:POKE 710,148:POK
E 711,55:POKE 756,58
310 COLOR 43:PLOT 0,0:DRAWTO 19,0:PLOT 0
,21:DRAWTO 19,21:COLOR 44:PLOT 0,1:DRAWT
O 0,20:COLOR 45:PLOT 19,1
320 DRAWTO 19,20:D=D(YR):R=R(YR):COLOR 0
330 IF D/1000>=1 THEN A=1:PLOT 7,0:DRAWT
O 11,0:D=D-1000
340 IF D/100>=1 THEN B=1:PLOT 19,8:DRAWT
O 19,12:D=D-100
350 IF D/10>=1 THEN C=1:PLOT 7,21:DRAWTO
 11,21:D=D-10
360 IF D THEN PLOT 0,8:DRAWTO 0,12
370 IF R THEN GOSUB (R*200)+300
380 GOSUB 100
390 GOSUB 180:GOSUB 110:IF STRIG(0) OR O
=0 THEN 390
410 SOUND 0,100,10,4:R(YR)=O+7:POSITION
X+1,Y-1:? #6;CHR$(O+1):O=0:SOUND 0,0,0,0
:GOTO 390
500 FOR W=6 TO 13:POSITION 8,W:? #6;";.:
":NEXT W:POSITION 8,6:? #6;"...":POSITIO
N 8,14:? #6;"..."
510 COLOR 254:PLOT 9,5:POSITION 4,22:? #
6;"your tardis":GOSUB 105
520 GOSUB 180:GOSUB 110:IF L<>174 THEN 5
20
570 GOSUB 580:? #6;"your control room":G
OSUB 105:X=9:Y=20:GOTO 600
580 ? #6;CHR$(125):COLOR 46:PLOT 0,0:DRA
WTO 19,0:DRAWTO 19,21:DRAWTO 11,21:PLOT
7,21:DRAWTO 0,21:DRAWTO 0,0
590 POSITION 8,10:? #6;"/.\":POSITION 8,
11:? #6;".@.":POSITION 8,12:? #6;"\./":P
OSITION 0,22:RETURN
600 GOSUB 180:IF STRIG(0)=0 THEN 670
610 IF Y<21 THEN 600
660 X=9:Y=16:GOTO 300
670 IF O<>6 THEN POSITION 0,22:? #6;"can
t drop that here":FOR N=1 TO 500:NEXT N:
GOTO 570
680 FOR N=255 TO 0 STEP -3:POKE 708,N:PO
KE 712,255-N:POKE 709,RND(0)*N:SOUND 0,N
,10,5:SOUND 1,255-N,10,3
690 NEXT N:SOUND 1,0,0,0:POSITION 5,13:?
 #6;"score ";TL*100:GOTO 8020
700 FOR W=7 TO 14:POSITION 9,W:? #6;".":
NEXT W:POSITION 8,15:? #6;";.:":POSITION
 8,6
710 ? #6;";.:":POSITION 0,22:? #6;"maste
rs tardis":GOSUB 105
720 GOSUB 180:GOSUB 110:IF L<>46 THEN 72
0
725 IF MT=0 AND O<>1 THEN POSITION 0,22:
? #6;"need a key to get in":FOR N=1 TO 5
00:NEXT N:Y=16:GOTO 300
730 GOSUB 580:? #6;"masters control room
":GOSUB 105:X=9:Y=20:Q=17:W=10
740 POSITION X,Y:? #6;CHR$(129):POSITION
 Q,W:? #6;CHR$(161):IF O THEN POSITION X
+1,Y:? #6;CHR$(O+1)
750 GOSUB 160:QQ=(X>Q)-(X<Q):WW=(Y>W)-(Y
<W):XX=0:YY=0:Z=STICK(0):IF Z<15 THEN XX
=X(Z):YY=Y(Z)
760 LOCATE X+XX,Y+YY,L:IF L>42 AND L<47
THEN XX=0:YY=0
770 LOCATE X+XX+1,Y+YY,L:IF L>42 AND L<4
7 THEN XX=0:YY=0
780 LOCATE Q+QQ,W+WW,L:IF L=129 THEN 850
790 IF L=6 THEN 820
795 IF STRIG(0)=0 AND O=1 THEN MT=1:O=0:
POSITION X+1,Y-1:? #6;CHR$(2)
800 POSITION X,Y:? #6;"  ":POSITION Q,W:
? #6;" ":X=X+XX:Y=Y+YY:Q=Q+QQ:W=W+WW:IF
Y<21 THEN 740
810 X=9:Y=17:GOTO 300
820 FOR T=1 TO 3:FOR N=255 TO 0 STEP -10
:POKE 712,N:SOUND 0,N,10,5:NEXT N:NEXT T
:O=6:POSITION Q,W:? #6;" "
830 SOUND 0,0,0,0:POKE 712,26:POSITION 0
,21:? #6;"master is dead  you have the t
ime drive"
840 FOR N=0 TO 1000:NEXT N:R(YR)=0:GOTO
300
850 POSITION 0,22:? #6;" he has killed y
ou ":GOTO 8000
1100 POKE 712,6:? #6;CHR$(125):W=0:COLOR
 46:FOR Q=5 TO 21:PLOT 0,Q:DRAWTO W,Q:PL
OT 19,Q:DRAWTO 19-W,Q:X=9
1110 W=W+(Q-5)/8:NEXT Q:POKE 710,10:POSI
TION 3,22:? #6;"a pit":GOSUB 105:IF O=4
THEN PI=0
1120 FOR Y=0 TO 17:POSITION X,Y:? #6;CHR
$(129);:IF O THEN ? #6;CHR$(O+1)
1130 SOUND 0,Y*15,10,4:GOSUB 160:FOR T=1
 TO 10:NEXT T
1140 POSITION X,Y:? #6;"  ":IF PI=0 THEN
 POSITION X,Y:? #6;CHR$(186)
1150 NEXT Y:POSITION 0,22:? #6;"a ray gu
n":SOUND 0,0,0,0:FOR T=1 TO 500:NEXT T
```

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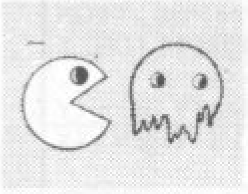
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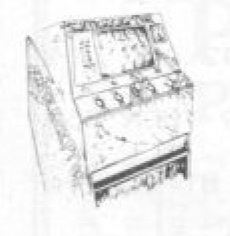
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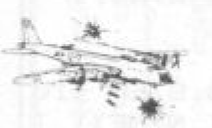
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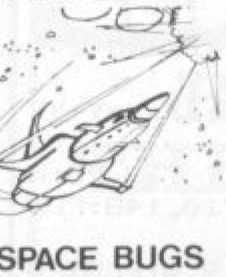
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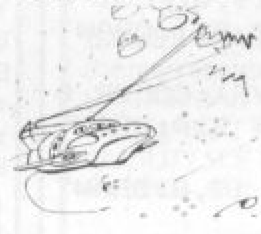
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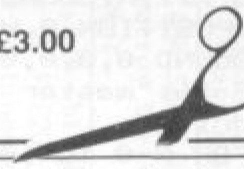
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```
1160 POSITION 0,22:IF PI THEN ? #6;"you are trapped":GOTO 8000
1170 ? #6;"climb up the rope":O=5:FOR Y=17 TO 0 STEP -1:POSITION X,Y:? #6;CHR$(129);CHR$(6)
1180 GOSUB 160:SOUND 0,Y*15,10,4:FOR T=1 TO 10:NEXT T:POSITION X,Y:? #6;"  ":NEXT Y:Y=20:YR=7:GOTO 300
1300 ? #6;CHR$(125):POKE 712,194:COLOR 46:PLOT 0,21:DRAWTO 19,21:FOR T=0 TO 3:PLOT 0,T+17:DRAWTO T,T+17
1310 PLOT 19,T+17:DRAWTO 19-T,T+17:NEXT T:POSITION 5,22:? #6;"a snake pit":GOSUB 105
1320 M=4:M=M+(X>5)*10:X=M:Q=15
1330 POSITION X,20:? #6;CHR$(129);:IF O THEN ? #6;CHR$(O+1)
1335 IF SL THEN POSITION Q,20:? #6;CHR$(137):QQ=(X>Q)-(X<Q)
1340 GOSUB 160:XX=0:Z=STICK(0):IF Z<15 THEN XX=X(Z)
1350 IF X+XX=3 OR X+XX=15 THEN 1400
1360 IF SL THEN LOCATE Q+QQ,20,L:IF L=129 THEN POSITION 2,22:? #6;"the snake bit you":GOTO 8000
1370 IF SL AND L=3 THEN 1450
1380 POSITION X,20:? #6;"  ":X=X+XX:IF SL THEN POSITION Q,20:? #6;" ":Q=Q+QQ
1390 FOR T=1 TO 50:NEXT T:GOTO 1330
1400 FOR Y=20 TO 16 STEP -1:POSITION X,Y:? #6;CHR$(129);:IF O>1 THEN ? #6;CHR$(O+1)
1410 SOUND 0,Y*10,10,4:FOR T=1 TO 40:NEXT T:SOUND 0,0,0,0:POSITION X,Y:? #6;"  ":X=X+XX:NEXT Y
1420 Y=9:YR=YR-(X<5)*4+(X>15)*4:M=(X<5)*17+(X>15)*1:X=M:GOTO 300
1450 SL=0:POSITION 0,22:? #6;"you killed the snake":FOR T=100 TO 200:SOUND 0,T,10,4:NEXT T:SOUND 0,0,0,0
1460 POSITION Q,20:? #6;" ":GOTO 1380
1500 IF SN=0 THEN 380
1510 Q=INT(RND(0)*8)+10:W=INT(RND(0)*15)+2:POSITION 0,22:? #6;"a sphinx":GOSUB 105
1520 POSITION Q,W:? #6;CHR$(42):POSITION X,Y:? #6;CHR$(129);:IF O THEN ? #6;CHR$(O+1)
1530 QQ=(Q<X)-(Q>X):WW=(W<Y)-(W>Y):XX=0:YY=0:Z=STICK(0):IF Z<15 THEN XX=X(Z):YY=Y(Z)
1540 LOCATE Q+QQ,W+WW,L:IF L=129 THEN 1600
1550 GOSUB 110:GOSUB 160:IF L=3 THEN 1650
1560 LOCATE X+XX,Y+YY,L:IF L>42 AND L<46 THEN XX=0:YY=0
1570 LOCATE X+XX+1,Y+YY,L:IF L>42 AND L<46 THEN XX=0:YY=0
1580 POSITION Q,W:? #6;" ":Q=Q+QQ:W=W+WW:POSITION X,Y:? #6;"  ":X=X+XX:Y=Y+YY:GOTO 1520
1600 POSITION 0,22:? #6;"the sphinx got you":GOTO 8000
1650 SN=0:POSITION 0,22:? #6;"the sphinx is dead":FOR T=100 TO 200:SOUND 0,T,10,4:NEXT T:SOUND 0,0,0,0
1660 FOR T=0 TO 300:NEXT T:GOTO 300
1700 COLOR 43:PLOT 12,17:DRAWTO 16,17:PLOT 11,18:DRAWTO 17,18:COLOR 163:PLOT 10,17
1710 COLOR 168:PLOT 14,16:POSITION 0,22:? #6;"high priest s temple":GOSUB 105:Q=13:W=16
1720 POSITION X,Y:? #6;CHR$(129);:IF O THEN ? #6;CHR$(O+1)
1730 POSITION Q,W:? #6;CHR$(95):XX=0:YY=0:Z=STICK(0):IF Z<15 THEN XX=X(Z):YY=Y(Z)
1740 GOSUB 110:GOSUB 160:LOCATE Q-1,W,L:IF L=129 THEN 1800
1745 IF X=9 AND Y=17 THEN O=2:POSITION 0,22:? #6;" you have the sword "
1760 LOCATE X+XX,Y+YY,L:IF L>42 AND L<46 THEN XX=0:YY=0
1770 LOCATE X+XX+1,Y+YY,L:IF L>42 AND L<46 THEN XX=0:YY=0
1780 POSITION X,Y:? #6;"  ":POSITION Q,W:? #6;" ":X=X+XX:Y=Y+YY:Q=Q-1:IF Q>0 THEN 1720
1790 Q=9:W=Y:GOTO 1720
1800 POSITION 0,22:? #6;"a lightning bolt hityou":IF O<>3 THEN 8000
1810 SOUND 0,200,10,4:FOR T=1 TO 300:NEXT T:POSITION 0,22:? #6;"the ring saved you      ":SOUND 0,0,0,0
1820 FOR T=1 TO 300:NEXT T:GOTO 300
1900 GOSUB 1910:? #6;"master s tardis key":GOTO 390
1910 POSITION 9,9:? #6;"<":POSITION 0,22:? #6;"a mummy case":GOSUB 105
1920 GOSUB 180:GOSUB 110:IF X<>8 OR Y<>9 THEN 1910
1930 IF R=14 OR R=15 THEN 1950
1940 V=0:O=R(YR)-7:R(YR)=V+7-(V=0)*7:POSITION X,Y:? #6;"  ":Y=Y-1:POSITION 0,22:GOSUB 3000:RETURN
1950 POSITION 8,22:? #6;"        ":Q=11:W=11
1960 POSITION Q,W:? #6;CHR$(40):POSITION X,Y:? #6;CHR$(129);:IF O THEN ? #6;CHR$(O+1)
1970 GOSUB 110:GOSUB 160:Z=STICK(0):QQ=(Q<X)-(Q>X):WW=(W<Y)-(W>Y):XX=0:YY=0:IF Z<15 THEN XX=X(Z):YY=Y(Z)
1980 LOCATE X+XX,Y+YY,L:IF L>42 AND L<46 THEN XX=0:YY=0
1990 IF X=Q AND Y=W THEN POSITION 0,22:? #6;"the mummy got you":GOTO 8000
2000 LOCATE X+XX+1,Y+YY,L:IF L>42 AND L<46 THEN XX=0:YY=0
2010 POSITION Q,W:? #6;" ":Q=Q+QQ:W=W+WW:POSITION X,Y:? #6;"  ":X=X+XX:Y=Y+YY:GOTO 1960
2100 GOSUB 1910:? #6;"a sword":GOTO 390
2300 GOSUB 1910:? #6;"a magic ring":GOTO 390
2500 GOSUB 1910:? #6;"some rope":GOTO 390
2700 GOSUB 1910:? #6;"a ray gun":GOTO 390
2900 GOSUB 1910:? #6;"the time drive unit":GOTO 390
3000 ? #6;"                    ":POSITION 0,22:RETURN
3100 GOTO 1910
3300 GOTO 1910
8000 COLOR 43:FOR W=21 TO 0 STEP -1:FOR Q=0 TO 19:SOUND 0,255,10,4:PLOT Q,W:SOUND 0,0,0,0:NEXT Q:NEXT W
8010 POSITION 5,5:? #6;" you lose ":? #6;"the master will rule+++ the universe ++":GOSUB 100
8020 POSITION 0,21:? #6;"press START to begin":IF PEEK(53279)<>6 THEN 8020
8030 RESTORE 56:R(1)=0:R(2)=0:R(6)=0:R(7)=0:RUN
```



```
 0REM *********************
 1REM *       SKIING       *
 2REM *   S.J. HARRIS      *
 3REM *********************
 8REM  NEEDS AN ATOM WITH 5K PROGRAM AND 3K SCREEN MEMORY
 9P.$21
10DIMLL10,SS10,PP20,OO20,B32,C32,W-1;SS2=-1;F.X=1TO2;DIMP-1
19REM CHARACTER PLOT
20[ASLA;ASLA;ASLA;TAX;LDY@0;:LL0LDA£2800,X;EOR£88;STA(£8B),Y
21INX;TYA;CLC;ADC@16;TAY;CMP@128;BNELL0;RTS
26\SCROLL SCREEN
27:LL2LDA@£81;STA£81;LDA@0;STA£80;:LL1LDY@128;LDA(£80),Y;LDY@0
28STA(£80),Y;;INC£80;BNELL1;INC£81;LDA£81;CMP@£8C;BNELL1;RTS
29:LL10LDX@0;:LL3LDAB,X;STAC,X;INX;CPX@16
30BNELL3;RTS;:LL9LDA£328;CMP@255;BNELL4;LDA@0;STA£328
31STA835;STA862;STA889;:LL4CMP@16;BNELL5;LDA@15;STA£328;:LL5RTS
32];GOS.e;[:SS0LDA@£60;STA£80;LDA@£88;STA£81;LDY@0;STY£83
33:SS1LDA(£80),Y;CMP@£FD;BNESS2;CPY£328;BMISS3;DEC£83;JMPSS2
34:SS3INC£83;:SS2INY;;CPY@16;BNESS1;RTS
35]
36N.;P=£2800;GOS.20000;REM CHARACTERS
37!P=£F8061010;P!4=£FE302030;P!8=£30583810;P!12=£20905834
38P!16=£38381010;P!20=£28283854;P!24=£2C1A1C08;P!28=£4091A2C
39P!32=£1F100808;P!36=£7F0C040C;P!40=£FE7E0E02;P!44=£2020232
40P!48=£18181608;P!52=£7E3C3C3C;P!56=£FFFF7E7E;P!60=£1010D6FF
41!£64=P;F.X=0TO15;X?B=8;X?C=8;N.;P!64=0;P!68=0
42F.J=1TOD;@=3;P.$12"PLAYER"J;IN.",WHAT IS YOUR NAME ",$PPJ
43CLEAR3;F.X=£8100TO£8D00S.4;!X=-1;N.;!£B0=0
44G=6;V=2;!£84=P;?£88=-1
45F.X=76TO148S.8;P!X=£FE;N.;P!72=£828282FE;P!80=£4040404;P!84=4
46P!88=£80FE02FE;P!96=£2FE02FE;P!104=£2FE8202;P!108=2;P!132=4
47P!112=£2FE80FE;P!120=£82FE80FE;P!128=£20202FE;P!136=£82FE82FE
48P!144=£2FE82FE;P!168=0;P!172=£15AA552A;P!176=0;L=0;O=0;F=5
49!160=-1;!164=-1;P!180=£54A85A00;P!184=0;P!188=£54AA5414
50F.X=0TO15;X?B=8;IFX?C=6 X?B=7
51N.;IFA.R.%10=1 Q=A.R.%13;B?Q=21;B?(Q+1)=22;B?(Q+2)=23
52IFA.R.%10=1;B?F=5;B?(F+5)=5;F=F+R.%4;F=(A.F)%10;G.54
53F.X=1TOA.R.%3;T=A.R.%16;T?B=6;N.;LI.SS7
54F.X=0TO15;?£8B=X;?£8C=£85;A=X?B;LI.W;N.
55A=20;?£8B=G;?£8C=£88;IF?£B001&128=0V=V-1;IFV<0V=0
56LI.W;IF?£B002&64=0V=V+1;IFV>4V=4
57N=50
59IFV=0G=G-1;N=55;GOS.d;G.68
60IFV=1G=G-1
```

SKI-

The air is cold and clear. Below, the snow-clad mountain lies silent. The slopes shimmer in the harsh light of the sun. The obstacle course you must navigate to remain champion is hidden from view by all this deceptive beauty.

Taking a deep breath you thrust yourself forward, determined to smash all existing records. Snow sings beneath your skis as you bob and weave to miss trees and hidden patches of ice. Eyes ache as they strain to pick out the flags you must pass between. Each obstacle hit or flag missed earns you a penalty of five seconds. Can you do it in the time required to retain the crown?

This game written for the 12K Atom includes all the exciting features of the popular arcade game. You can compete with up to sixteen other players. A rundown of all the times is given at the end of each competition. During each individual run, time readout is displayed at the top right of the screen.

The only controls used are SHIFT for left turns and REPT for right turns.



-ING

BY S. J. HARRIS

RUNS ON AN ATOM IN 12K

```
61IFV=3G=G+1
62IFV=4G=G+1;N=55;GOS.d;G.68
63LI.LL2;LI.LL10
68LI.LL9
70A=V;?£8C=£88;?£8B=G;U=?(£8850+G);LI.SS0
71IFU=255;?£8E=0;?£8D=5
72IFU<255LI.LL6;A=5;LI.SS6
73IF?£83>0A=5;LI.SS6
75LI.SS9
80IFN<>55L=L+1
81A=1;LI.SS6
82?£8B=G;?£8C=£88;A=V;LI.W;?£88=0
83LI.SS4
89?£88=-1
90IFL=100G.1900
91G.N
1000eREM HIT OBJECT
1010[:LL6LDY@£FF;:LL7LDX£80;:LL8DEX;BNELL8;LDA£B002;EOR@4
1011STA£B002;INC£80;LDA£80;CMP@255;BNELL7;RTS
1020\PRINT TIME
1021:SS4LDA@£2A;STA£8B;LDA@£80;STA£8C;LDA@1;STA£8D;:SS5LDX£8D
1022LDA£B0,X;LSRA;LSRA;LSRA;LSRA;CLC;ADC@09;JSRW;LDX£8D;INC£8B
1023LDA£B0,X;AND@15;CLC;ADC@09;JSRW;DEC£8D;INC£8B;LDA£8D
1024CMP@£FF;BNESS5;RTS
1029\ADD 'A' TO SCORE (BCD)
1030:SS6SED;CLC;ADC£B0;STA£B0;LDA@0;ADC£B1;STA£B1;CLD;RTS
1039\PRINT NEW LINE OF CHARS
1040:SS7LDX@0;STX£8D;LDA@000;STA£8B;LDA@£8B;STA£8C;:SS8LDX£8D
1041LDAB,X;JSRW;INC£8B;INC£8D;LDA£8D;CMP@16;BNESS8;RTS
1049\READ SCREEN UNDER SKIER
1050:SS9LDX@0;LDY£328;STX£80;LDA@£86;STA£81;:SS10LDA(£80),Y
1051EOR@255;STA£28A0,X;INX;TYA;CLC;ADC@16;TAY;CPX@8;BNESS10;RTS
1060];R.
1899REM REACHED BOTTOM
1900!£8B=G+£6000;F.X=1TO12;A=8;LI.W;LI.LL2;A=2;LI.W;WAIT;WAIT
1901N.;O=!£B0&£FFFF
1999DO
2000A=8;LI.W;!£8B=!£8B+16;A=2;LI.W;WAIT;WAIT;U.!£8B>£8870;GOS.d
2001P.$12$PPJ",YOU MANAGED A TIME OF";@=5;P.&O'"SECONDS"''''
2002P."<HIT THE SPACE BAR TO CONTINUE>";LI.£FFE3;OOJ=O;N.
2500P.$12"THE FINAL SCORES ARE"''
2501F.J=1TOD;F.X=1TO20-LENPPJ;P." ";N.;P.$PPJ,&OOJ';N.;E.
10000dF.R=1 TO15;WAIT;N.;R.
20000P.$6$12;IN."HOW MANY PLAYERS "D;IFD<1ORD>16G.20000
20001M=£3A00;F.X=1TOD;PPX=M;M=M+32;N.;R.
```

VARIABLES

- A: Passes parameters to machine code.
- B: Contains the next row of characters to be printed.
- C: Contains the last row of characters to be printed.
- D: Number of players.
- F: Positions of next flags.
- G: Position of skier across the screen.
- J: Player number.
- L: Distance down the slope.
- M: String locations for names.
- N: Line number (either 50 or 55) depending on whether skier moves or not.
- O: Final score.
- P: Assembly position counter and start of characters.
- Q: Position of ice.
- R: Delay loop counter.
- T: Trees position.
- V: Direction of skier.
- W: Address of character plot routine.
- X: General loop counter.
- LLx: Assembly labels.
- OOx: Times.
- PPx: Name strings.
- SSx: Assembly labels.

Illustration: Terry Rogers



BY L. ANDERSON

RUNS ON A DRAGON IN 32K

TURBO CAR

Put the pedal to the metal and zoom off on a fast and furious race track battle.

This is a version of that addictive arcade game where you control a high powered race car and attempt to dodge traffic coming at you along the track.

The car is controlled by the Dragon's "m" and "n" keys. The longer you survive on the road the more points you earn. The authors high score stands at 639 — can anyone beat it?

Variables

HI: high score. CR: ASCII code for road background. FF: width of road. DL: difficulty level (1-5). YS: your car. Y: your position. A: position of road. B: variable to move road left, right or middle.

Illustration: Jon Davis

```
10 POKE&HFFD7,0
20 CLS0
30 REM TURBOCAR BY L.ANDERSON
40 REM START
50 CLEAR 100
60 HI=500:HI$="KILROY"
70 CR=73
80 INPUT"SELECT DIFFICULTY(1-5)";DL:IF DL<1 OR DL>5 THEN 80 ELSE FF=8-DL*0.7
90 Y$=CHR$(253)+CHR$(248)
100 PLAY"T255L25502":CLS0:Y=16:A=496:B=1
110 FOR L=1 TO 1E6
120 G=(PEEK(&H158)=247)-(PEEK(&H157)=247)
130 Y=Y+G
140 IF RND(3)=2 THEN B=RND(3)-2
150 A=A+B
160 C=510.5-(A+FF):D=A-478
170 C$=STRING$(C,CR):D$=STRING$(D,CR)
180 IF A>507-FF THEN B=-1 ELSE IF A<482.5 THEN B=1
190 IF RND(3)+DL=2 THEN PRINT@A+RND(FF-1)-31,CHR$(RND(8)*16+127);
200 PRINT@481,D$;::PRINT@A,STRING$(FF+1,128);:PRINT@A+FF+1,C$
210 IF PEEK(1024+Y)<>128 OR PEEK(1025+Y)<>128 THEN 260
220 PRINT@Y,Y$;:PLAY"C
230 H=H+1:IF H=64 THEN H=1:CR=RND(8)*16+125
240 NEXT
250 GOTO 270
260 Y=Y+G:PRINT@Y,Y$;:FOR K=1 TO 20:SOUND RND(150),1:POKE 1024+Y,RND(120)+130:NE
XT:PRINT@Y,STRING$(2,239);:PLAY"L4T402CADFGA03E"
270 CLS3:PRINT"YOU SCORED"L"POINTS
280 IF L>HI THEN GOSUB 300
290 INPUT"DO YOU WANT ANOTHER GO(Y/N)";A$:IF LEFT$(A$,1)<>"N"THEN 70 ELSE END
300 PRINT:PRINT"YOU HAVE BEATEN THE HIGH SCORE  OF"HI"WHICH WAS HELD BY"HI$
310 HI=L
320 INPUT"PLEASE ENTER YOUR NAME";HI$:IF LEN(HI$)>6 THEN 320
330 RETURN
```

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Rockfall

```
   0 REM ** ROCKFALL BY DAVID MCKERAN **
  10 P%=&C00:+ OPT0:+ SIDE SCROLL ROUTINE
  20 LDY#&FF:STY&72:INY:STY&74:STY&70
  30 LDX#&7B:STX&73:INX:STX&75:STX&71
  40 LDA#&20:STA(&74),Y:CLC:TYA:ADC#&28:TAY
  50 BCCP%-9:INC&75:BPLP%-13:LDY#&00
  60 LDA(&70),Y:STA(&72),Y:INY:BNEP%-5:INC&73:INC&71:BPLP%-11:RTS:+
  70 IFH%(0THENH%=0
  80 B%=ASC"&":HIMEM=HIMEM-1
 100 MODE7 :VDU23;8202;0;0;0;0 :ON ERROR GOTO 5000
 110 PROCBIG("ROCKFALL")
 120 PRINT'"THE OBJECT OF THE GAME IS TO TRY TO"
 130 PRINT'"REACH THE RIGHT HAND EDGE OF THE SCREEN"
 140 PRINT'"WITHOUT BEING HIT BY A FALLING ROCK"
 150 PRINT''"MOVE LEFT AND RIGHT BY PRESSING THE"
 160 PRINT'"ARROWED KEYS"'''"PRESS ANY KEY TO START" :X%=GET
 200 S%=20 :XX%=0 :X%=0
 210 R%=27 :L%=0
 220 REM ** S%=Distance down screen
 230 REM ** R%=Probability of rock
 240 REM ** C%=Key repeat speed
 300 VDU28,0,24,39,0 :XX%=XX%+X% :S%=S%-1 :IFS%=8THEN S%=9
 310 CLS :PRINTTAB(0,24)"LONGEST ";H%;TAB(20)"DISTANCE ";XX%;TAB(0,0)
 320 Y%=&7C00+S%*40 :?Y%=B% :L%=L%+1
 330 PROCBIG("LEVEL "+STR$L%)
 350 T%=TIME+150 :REPEAT :UNTILTIME=T%
 360 R%=R%-2 :PRINTTAB(10,3)STRING$(60," ")
 370 M%=255 :X%=0
 500 REPEAT
 510 P%=RND(39)-1 :D%=RND(38-P%)+P%
 520 VDU28,P%,23,D%,0 :PRINT TAB(RND(38-P%),0);
 530 Z%=Y%+X% :A%=?215AND127
 540 IFA%()M%THEN600 ELSE IFC%=0THEN600 ELSE C%=C%-1 :GOTO800
 600 M%=A% :C%=2 :X%=X%-(A%=121)+((A%=25)AND(X%)0))
 610 IF?(Y%+X%)=255THEN ?Z%=32 :GOTO810
 800 ?Z%=32 :IFRND(30))R% THEN VDU255,11 :ELSE VDU32,11
 810 Z%=?(Y%+X%) :?(Y%+X%)=B%
 820 $&7FDD=STR$(XX%+X%)
 830 UNTIL X%=39 OR Z%=255
 840 IFZ%=255 THEN 1000
 900 FORZ%=1TO39 :CALL&C00 :FORM%=1TO30
 910 NEXTM%,Z% :GOTO300
1000 ?(Y%+X%)=64 :VDU26 :PROCBIG("SPLAT!")
1010 T%=TIME+150 :REPEAT :UNTILTIME=T%
1020 XX%=XX%+X% :CLS :*FX15,0
1030 PRINT'''"YOU REACHED A "; :IFXX%-H%)250 THEN PRINT"STAGGERING ";
1040 IFH%-XX%)250 THEN PRINT"MEASLY ";
1050 PRINT"DISTANCE OF ";XX%''
1060 IFXX%(H% THEN PRINT"THE LONGEST RECORDED DISTANCE IS ";H% :GOTO2000
1070 IFXX%=H% THEN PRINT"YOU EQUALED THE RECORD!" :GOTO2000
1080 PRINT"YOU BEAT THE RECORD!" :H%=XX%
2000 A$=INKEY$(1000) :GOTO100
4000 DEFPROCBIG(A$) :FORZ%=3TO4
4010 PRINT TAB(18-LEN(A$)/2,Z%) CHR$141 A$ CHR$142
4020 NEXT :ENDPROC
5000 VDU23;29194;0;0;0;0,26
5010 PRINT
5020 IFERR()17 THEN REPORT :PRINT" in line ";ERL
```

Illustration: Terry Rogers

RUNS ON A BBC

MODEL A OR B IN 16K

BY DAVID McKERAN

Climbing mountains can be a dangerous pastime. There are many hazards — but the one most feared is an avalanche. A deluge of falling rocks can prove fatal . . .

The object of this game is to steer your climber across the screen while avoiding the falling rocks. The rocks fall at different speeds and densities — becoming increasingly harder as you get towards the edge of the screen. Once across you are whisked away to begin a harder screen.

The high score is not reset at the start of the game and may be cleared by entering H%=0.

Program notes

Lines 10-60: set up the machine code routine to scroll the screen sideways. (CALL and COO).

200-210: initialise variables at the start of a new game.

300-370: set up next screen.

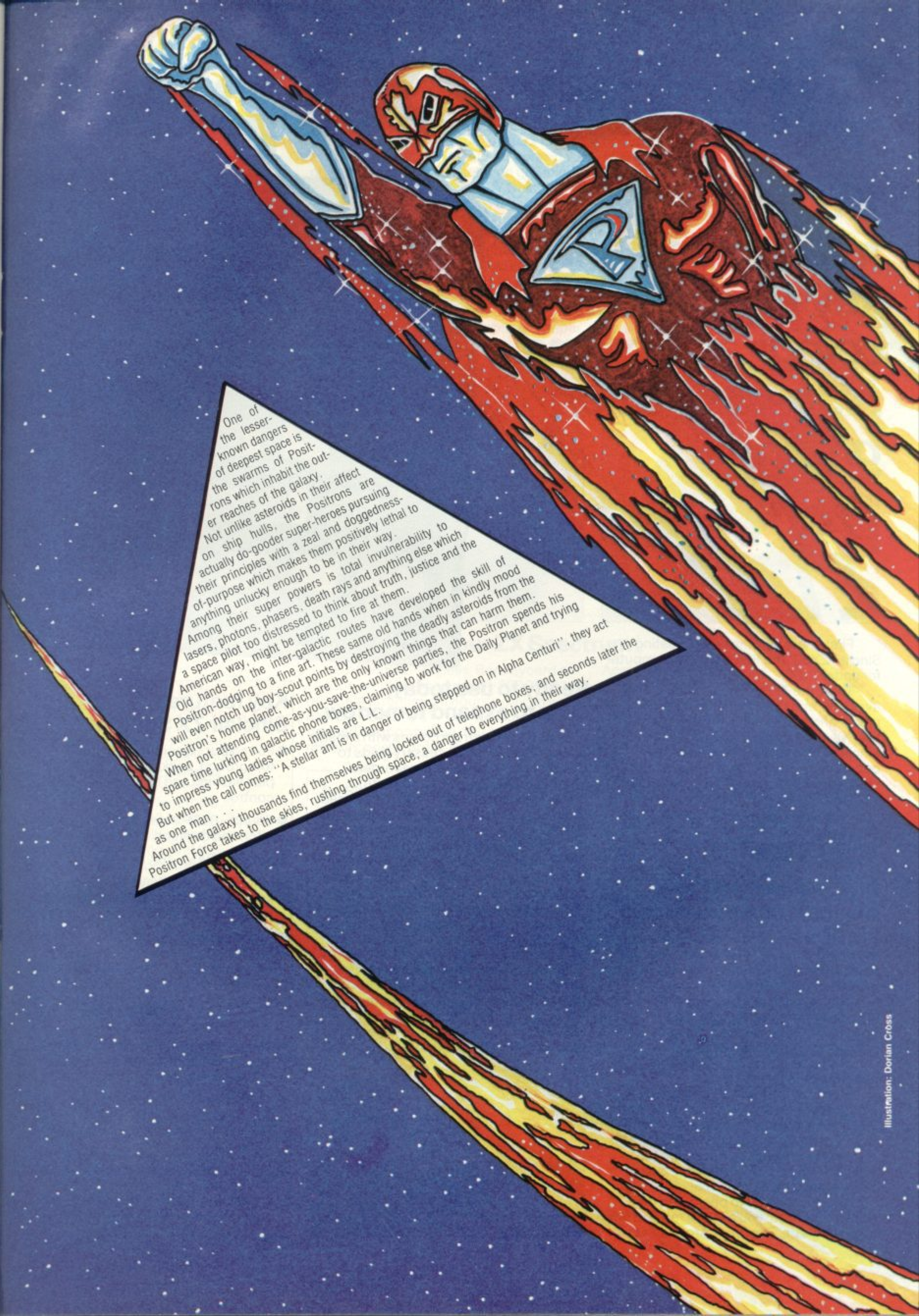
500-830: plays the game until edge is reached or man is crushed.

POSITRON 4

RUNS ON A ZX81 IN 16K

BY GARY SPURDENS AND HARRISON AINSWORTH

```
   5 SLOW
  10 GOSUB 8000
 130 LET D=10
 135 LET D=21-(D*2)
 140 POKE 22002,D
 145 CLS
 150 FOR J=1 TO 11
 160 PRINT ,,,,
 170 NEXT J
 180 POKE 22000,4
 190 LET DF=429+PEEK 16396+256*P
EEK 16397
 200 POKE 22001,16
 210 POKE 22005,0
 215 POKE DF+PEEK 22001,59
 220 DIM M$(4,32)
 230 LET M$(1)="■   ■ ■   + ■  ■
 ■+    ■ ■    +     "
 240 LET M$(2)="  ■   ■       ■  ■
  ■ ■ ■ +  ■    "
 250 LET M$(3)="   ■    ■ ■     ■■
 + ■    ■ +  ■ ■  "
 260 LET M$(4)="  ■     ■      + ■
  ■   ■     +  ■    "
 270 LET M=INT (RND*4+1)
 280 LET LL=INT (RND*31+1)
 290 LET M$(M)=M$(M,LL TO )+M$(M
, TO LL)
 300 SCROLL
 310 PRINT M$(M)
 320 LET XX=USR 22014
 330 PRINT AT 0,5;"NP:";USR 2201
0;TAB 21;"L:";PEEK 22000
 350 LET O$=INKEY$
 360 IF O$="8" OR O$="0" THEN GO
TO 500
 365 POKE 22003,PEEK 22001
 370 IF O$="1" THEN POKE 22001,P
EEK 22001-1
 380 IF O$="3" THEN POKE 22001,P
EEK 22001+1
 390 IF PEEK 22001=1 THEN POKE 2
2001,2
 395 IF PEEK 22001=32 THEN POKE
22001,31
 400 POKE DF+PEEK 22003-33,27
 410 IF PEEK (DF+PEEK 22001)=149
 THEN GOTO 1000
 420 POKE DF+PEEK 22001,59
 440 GOTO 270
 500 REM ■■LASER FIRING■■
 510 LET MP=PEEK 22001-33+429
 515 LET DF=DF-429
 520 IF O$="8" THEN LET MP=MP+32
 530 IF O$="0" THEN LET MP=MP+34
 535 POKE 22004,PEEK (DF+MP)
 540 POKE DF+MP,11
 550 IF PEEK 22004=149 THEN POKE
 DF+MP,23
 560 IF PEEK 22004=21 THEN POKE
DF+MP,149
 590 POKE DF+MP,0
 600 IF PEEK 22004=21 THEN LET X
X=USR 22022
 610 IF NOT (PEEK 22004=149 OR M
P-INT (MP/33)*33=1 OR MP-INT (MP
/33)*33=32 OR MP>693) THEN GOTO
520
 620 PRINT AT 0,5;"NP:";USR 2201
0
 625 LET DF=DF+429
 630 GOTO 350
1000 REM ■■EXPLOSION■■
1010 LET X=USR 800
1020 POKE DF+PEEK 22001,23
1030 PAUSE 5
1040 POKE 16437,255
1050 LET X=USR 800
1060 POKE DF+PEEK 22001+1,129
1070 POKE DF+PEEK 22001-1,3
1080 POKE DF+PEEK 22001+33,133
1090 POKE DF+PEEK 22001-33,1
1100 LET X=USR 800
1110 PAUSE 8
1120 POKE 16437,255
1130 POKE DF+PEEK 22001+1+33,134
1140 POKE DF+PEEK 22001-1+33,6
1150 POKE DF+PEEK 22001-1-33,134
1160 POKE DF+PEEK 22001+1-33,6
1170 PAUSE 13
1180 POKE 16437,255
1190 POKE DF+PEEK 22001,8
1200 POKE 22000,PEEK 22000-1
1210 PRINT AT 1,21;"L:";PEEK 220
00
1220 IF PEEK 22000 THEN GOTO 270
2000 REM ■■END PRINT■■
2010 PRINT AT 0,0;M$(M)
2020 PRINT "              YOU ARE DE
AD"
2030 PRINT AT 20,0;" YOU TRAVELL
ED ";USR 22010;" NANO-PARSECS"
2040 PAUSE 42000
2050 POKE 16437,255
2060 SCROLL
2070 SCROLL
2080 SCROLL
2090 PRINT AT 20,5;"? ANOTHER GO
 ?"
2100 PRINT TAB 8;"(Y OR N)"
2110 PAUSE 42000
2120 POKE 16437,255
2130 CLS
2135 GOSUB 8140
2140 IF INKEY$<>"N" THEN RUN 130
2150 STOP
8000 REM ■■INSTRUCTIONS■■
8010 PRINT ,,"■   ■   ■■INSTRUCT
IONS■■ ■  ■  ■"
8020 PRINT "■■■■■■■■■■■■■■■■■■■■■■■■
■■■■■■■■■■■■■■■■"
8030 PRINT ,," YOU HAVE GOT TO T
RAVEL THROUGH THE POSITRONS (■)
FOR AS LONG ASYOU CAN."
8040 PRINT ,," YOU HAVE 4 LIVES;
 EACH TIME YOU HIT A POSITRON YO
U LOSE A LIFE."
8050 PRINT ,," OCCASIONALY PLUS
SIGNS APPEAR  ON THE SCREEN. YOU
 MUST TRY TO  ZAP THESE WITH YOU
R LASER. EVERYTIME YOU HIT ONE Y
OUR SCORE IS  INCREASED BY 5."
8060 PRINT ,," YOUR CURRENT SCOR
E (NP) AND YOUR LIVES REMAINING
ARE DISPLAYED  AT THE TOP OF THE
 SCREEN."
8070 PRINT AT 21,3;"-PRESS A KEY
 TO CONTINUE-"
8080 PAUSE 42000
8090 POKE 16437,255
8100 CLS
8110 PRINT "■ AND ■ MOVE YOU LEFT
 AND RIGHT"
8120 PRINT ,,"■ AND ■ FIRE LEFT
AND RIGHT"
8140 LET S=22010
8150 LET M$="010000C92AFB552322F
B55C92AFB5511050019 22FB55C9"
8160 FOR N=1 TO LEN M$ STEP 2
8170 POKE S,16*(CODE M$(N)-28)+C
ODE M$(N+1)-28
8180 LET S=S+1
8190 NEXT N
8200 RETURN
9000 SAVE "ASTEROID■"
9010 RUN
```



One of the lesser-known dangers of deepest space is the swarms of Positrons which inhabit the outer reaches of the galaxy.

Not unlike asteroids in their affect on ship hulls, the Positrons are actually do-gooder super-heroes pursuing their principles with a zeal and doggedness-of-purpose which makes them positively lethal to anything unlucky enough to be in their way.

Among their super powers is total invulnerability to lasers, photons, phasers, death rays and anything else which a space pilot too distressed to think about truth, justice and the American way, might be tempted to fire at them.

Old hands on the inter-galactic routes have developed the skill of Positron-dodging to a fine art. These same old hands when in kindly mood will even notch up boy-scout points by destroying the deadly asteroids from the Positron's home planet, which are the only known things that can harm them.

When not attending come-as-you-save-the-universe parties, the Positron spends his spare time lurking in galactic phone boxes, claiming to work for the Daily Planet and trying to impress young ladies whose initials are L.L.

But when the call comes: "A stellar ant is in danger of being stepped on in Alpha Centuri", they act as one man . . .

Around the galaxy thousands find themselves being locked out of telephone boxes, and seconds later the Positron Force takes to the skies, rushing through space, a danger to everything in their way.

Illustration: Dorian Cross

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

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The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

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You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

rum



The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.



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ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

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GO

BY ALLAN SCARFF

In Go, unlike chess, material gains and losses are relatively unimportant when compared with other strategic matters.

Chess reflects the western style of warfare based on direct power and strength. Go is more subtle, resembling guerilla warfare as waged in Vietnam by the Vietcong who used Go in the military training of their officers.

While losing a group of stones may be disastrous, in some situations it can be positively beneficial. A good understanding of the status of each group on the board (or screen) is a prerequisite for making sound strategic decisions. So in this article we shall explore the basics of life and death.

Two or more eyes are alive

Consider the black group marked a in figure 1. Even though the outside intersections are occupied by white, white can never play at points A1 and A3 (these points are examples of eyes) because the rules of Go prohibit more than one move at a time and ban suicide.

The group marked b is more typical of a game situation. Although each eye is comprised of several intersections, allowing white to play inside them, the suicide rule will still prevent the capture of the black group.

One eye or less is dead

Consider the white group in figure 2. It has only one eye and cannot be given another because there is not enough space and the surrounding black group has two eyes and therefore cannot be killed. Note that black should not waste points by playing on the adjacent intersections (marked with x's), while his opponent makes gains elsewhere.

Critical groups

Consider the black group marked a in figure 3. If black gets to play at A2, the group will live but if white manages to play there first, the group is likely to die.

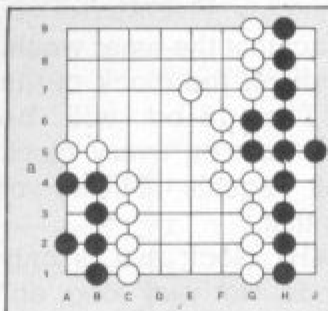


Fig 1. Unconditionally Alive

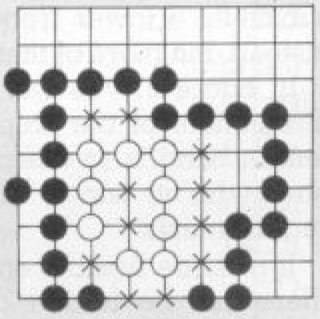


Fig 2. Unconditionally Dead

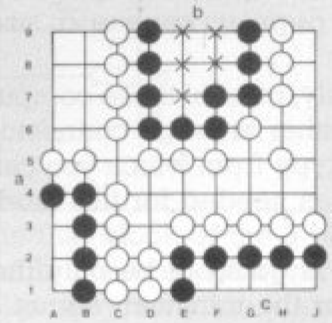


Fig 3. Indeterminate Status

White can capture the group by continuing to play inside the eye (see the sequence given in figure 4).

If the surrounding white group can be attacked it may be a race to kill or be killed.

However, if white can make his surrounding group unconditionally alive he can remove the one-eyed black group at the end of the game.

It is slightly more difficult to judge the status of the group marked b. If white plays inside first, can black still make two eyes? The answer is no.

In fact this eye shape is known as the "hatchet five" and it is well known by most Go players that if white plays at the join of the handle to the axe head, the shape will eventually reduce to one eye. Of course if black plays there first he will be safe.

In contrast to the previous two groups, the group marked c, though not yet strictly alive, is almost impossible to kill. Black has two choices as to where to play to form a second eye so he can afford to wait until white has played on one before replying on the other.

When an eye is too big

Consider figure 5. White has enough space to form a one-eyed group of his own inside the black group. The black group is not therefore unconditionally alive but is quite safe because he would have to ignore no fewer than nine moves in order to lose his group.

However, the danger is greater the larger the eye space and the more white stones there are within it. To be absolutely safe the eye space must be a shape that cannot accommodate an opponent group with its own eye.

Counting the eyes

At least to start with, we need to radically simplify the problem to attempt a practical computer solution. One method can be outlined as follows:

- Detect the eye spaces bounded by black stones, ignoring white stones.
- Reject any space which is too big.
- Reject any space not bounded by a single group of connected stones.
- Count the eyes associated with each group.
- Repeat the process for the white stones, ignoring black stones.

Decisions decisions!

Having determined the status of each group — even if only approximately — a whole universe of decision making is opened up.

One simple but large improvement that can be made to our computer program is the suppression of needless moves capturing already dying stones within eyes. But by examining the status of neighbouring groups, quite sophisticated play can be devised.

For instance, a policy of attacking large one-eyed or eyeless groups can be implemented.

But there is no one golden strategy. The best Go programs balance and select between competing strategies. How such programs manage this is another story for another day!

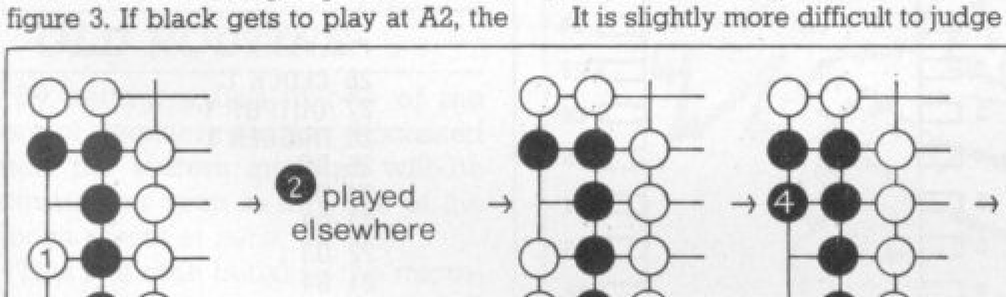
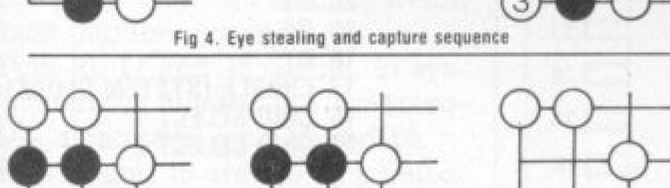


Fig 4. Eye stealing and capture sequence



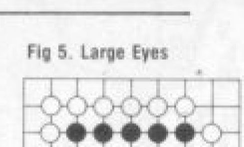


Fig 5. Large Eyes

Projects

MORE THAN A WORD CAN SAY

Welcome to the Projects page where I'll start on the development of projects which you have always wanted to build but have never really got around to.

As with Kit Korner, I will be describing the constructional aspects, paying special attention to the laying out of the circuit. Unlike it, I will be showing you how to use the circuit to full advantage.

There will be far more informative diagrams than in the past, primarily to reduce my volume of typing. After all a picture is worth a thousand words!

TAKING TIME . . .

To start off with I have chosen the Motorola 6840 programmable timer module around which to design a usable circuit.

We are all preoccupied with time. This design will go some way towards attaining the ideal from your computer.

The programmable timer module, (PTM), has three 16-bit binary counters which are addressed using a normal 8-bit data bus.

How come? I hear you cry. Well, quite simply you store two sets of 8-bits which the chip understands as one 16-bit set.

One of the difficulties to overcome is the fact that the timer would normally work off the clock of the computer. The 16-bit will be decreased by one on every clock cycle. 16-bit equals 64,000, or aroundabout that.

With a 1MHz clock that is only 64 milliseconds. Not very long, eh? To overcome that problem we just substitute a lower frequency clock instead. But more of that next month.

In figure 1, you will see the pin assignment of the chip. The problem in hand is to design a suitable circuit for it, which will serve our requirements.

It must be flexible enough so that there can be further development but also be compact enough to sit inside the popular keyboard size computers.

Fortunately, most of these computers have either an edge connector or another type from which you can take the lines needed for this module.

As there is going to be only the one chip for the minimum circuit I would probably use stripboard. Otherwise I would be tempted to wirewrap on a form of Eurocard and to use up the extra space with other periferals.

The chip requires a single 5-volt supply which is very convenient of them. The 8 data lines, 0-7, are there, of course, as well as two chip select lines.

The "enable" pin is, in fact, the system clock. Each timer has three separate registers; a decrementing clock, a start trigger, and an output line for indicating that the time has elasped.

There are three register lines with which to select the data and status registers. The last two lines are reset and interrupt request.

CHIPS AND PINS

In figure 2 I have drawn a brief outline of the chip and to what the pins must be connected. Pins 1 and 14 are obvious. The others may require a little explaining.

The data lines, though, interface directly with those on the main board.

Working in number order around the chip after the ground pin we come to the second timer lines.

Pin 2, the trigger line, or gate line sets counter 2 going as soon as the initialisation is complete.

Pin 3, the output line, indicates when the period of timing is over and will drive 2 TTL loads.

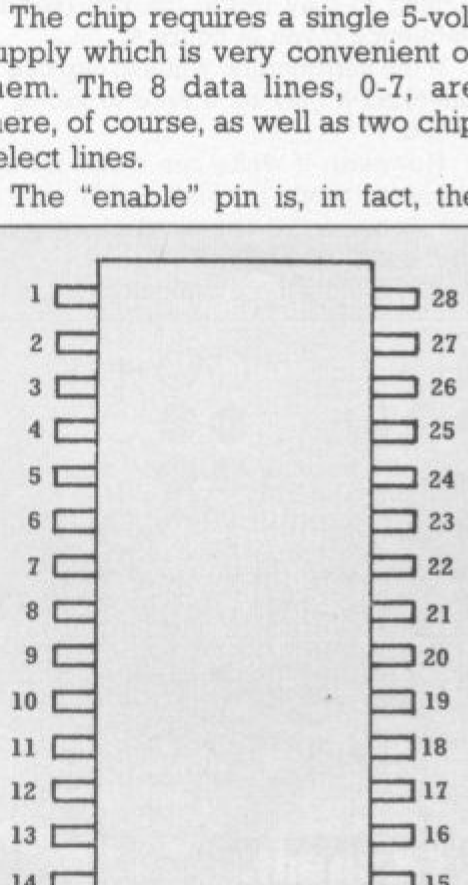
Pin 4, the clock input for timer 2 defines the rate at which the binary number loaded into the timer is decremented.

This clock rate can vary up to the 'enable' clock which would normally be 1MHz. For most applications 1kHz would be sufficient and give a maximum count time of about 1 minute.

By using a simple 555 timer chip

Fig 1 Pin Assignment

Pin
1 GROUND
2 TRIGGER 2
3 OUTPUT 2
4 CLOCK 2
5 TRIGGER 3
6 OUTPUT 3
7 CLOCK 3
8 RESET
& INTERRUPT REQUEST
10 REGISTER SELECT 0
11 REGISTER SELECT 1
12 REGISTER SELECT 2
12 READ/WRITE
14 5 VOLT



Pin
28 CLOCK 1
27 OUTPUT 1
26 TRIGGER 1
25 D0
24 D1
23 D2
22 D3
21 D4
20 D5
19 D6
18 D7
17 ENABLE (SYSTEM CLOCK)
16 CHIP SELECT 1
15 CHIP SELECT 0

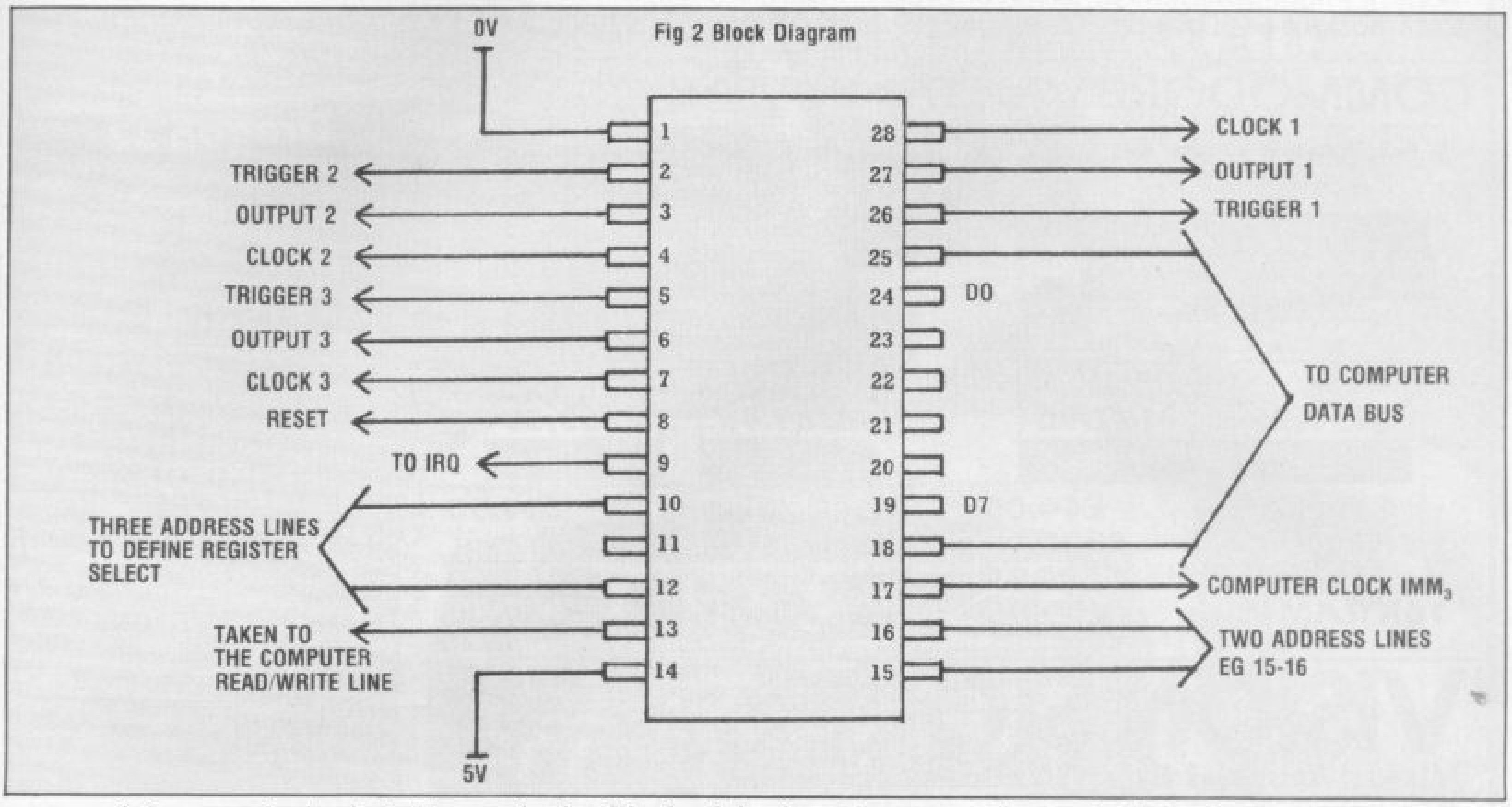


Fig 2 Block Diagram

or one of the new decimal divider chips almost any frequency can be defined.

Pins 5, 6, 7 and, likeways, 26, 27 and 28 I have explained in the last paragraph.

The reset line, pin 8, does exactly that. It will, whenever activated, reset the counters to their initial values, which are held in on-chip memory.

All that is then required is the triggers and the counters will start off, together, if required. The next pin, pin 9, houses the IRQ line, or interrupt request line.

OLD ROUTINE . . .

By setting a flag in one of the control registers (to be discussed later) the system interrupt will be activated as soon as any one of the clocks resets at zero.

This will then initialise the microprocessor's interrupt routine which is built into the system.

Pins 10, 11 and 12 define, in system memory where the timer resides, along with pins 15 and 16.

Pins 15 and 16 are the chip select 1 and 0 respectively. CSO must be at zero and CS1 must be at one for the chip to be addressed.

These two lines define the block in memory and the three register select lines define the location within that block of the 8 registers.

In this respect it works in a similar way to a periferal interface adapter, PIA.

The read/write line works in exactly the same way as it does in the rest of the system. For reference, the state of any of the registers may be read while the counter is in operation. This can be very helpful when setting up the counters for the first time.

As I have said before, the enable at pin 17 is the synchronous clock for reading and writing data to and from the counters.

It can, of course, be used for the timers' clock if very short periods are required from the counters.

If you are using a computer with a two phase clock this can be used directly with the counters.

Unfortunately, these days many processors only require a single phase so I will indicate how to derive the correct signal later.



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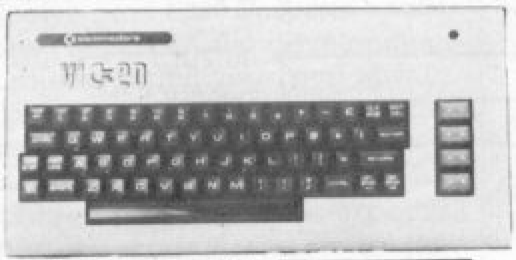
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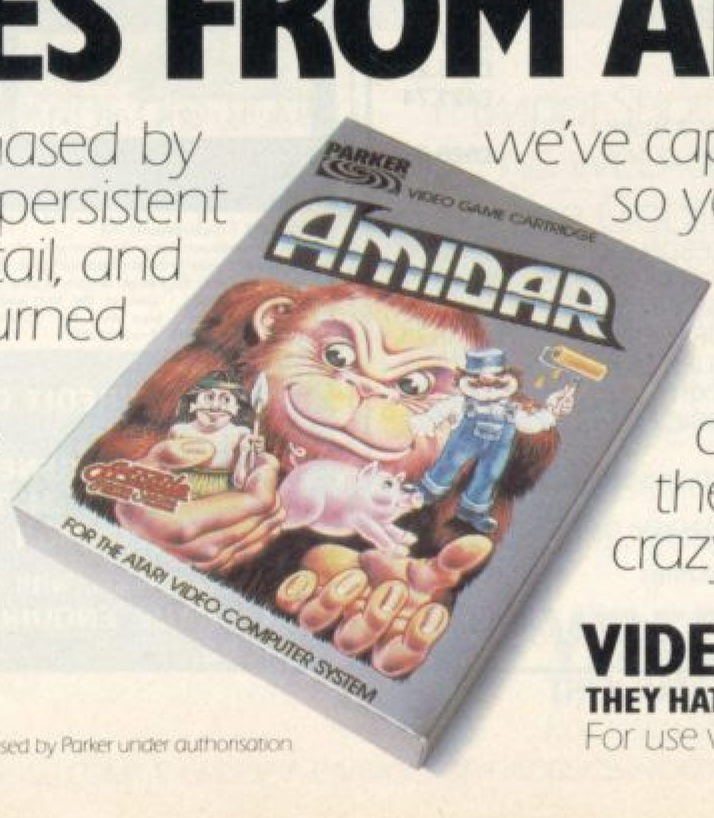
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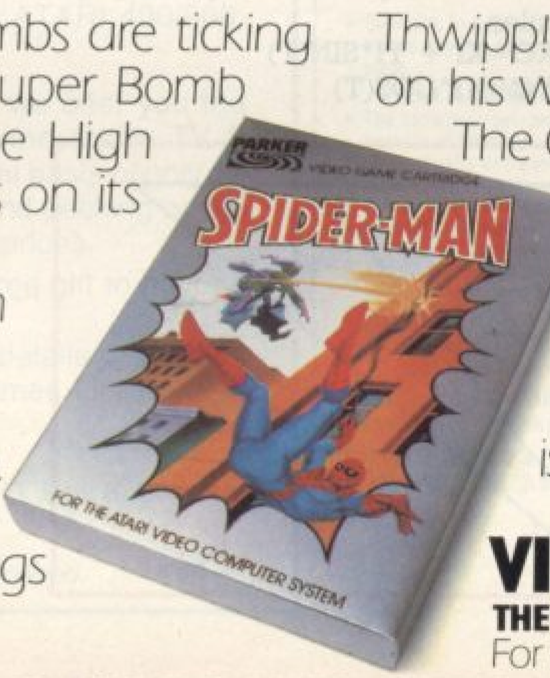
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PLAY AROUND WITH PATTERNS

Experimenting with the rules for generating patterns of movement can produce many intriguing displays — and here I aim to set out some of those rules for you to play around with.

The pattern of movement of a point in a plane can be described by giving the position of the point at any time in terms of its initial position and the time.

If the initial position is given by the co-ordinates (XI, YI), and the current position by (XC, YC) then a typical way of giving the position at any time, T, is

XC =XI + T*YI
XC=YI

Note that the initial position corresponds to T=0, since this value for T gives

XC=XI
YC=YI

That is to say that at T=0 the current position is the same as the initial position.

The rules just given provide only one example of how the current position can be expressed in terms of the current time and the initial position.

Since we can describe the movement of a point in this way we can also deal with the pattern of movement of a flat object by examining how the points that are joined by its edges behave.

Next month we shall examine how solid, three-dimensional objects behave by applying the same idea to its corner points.

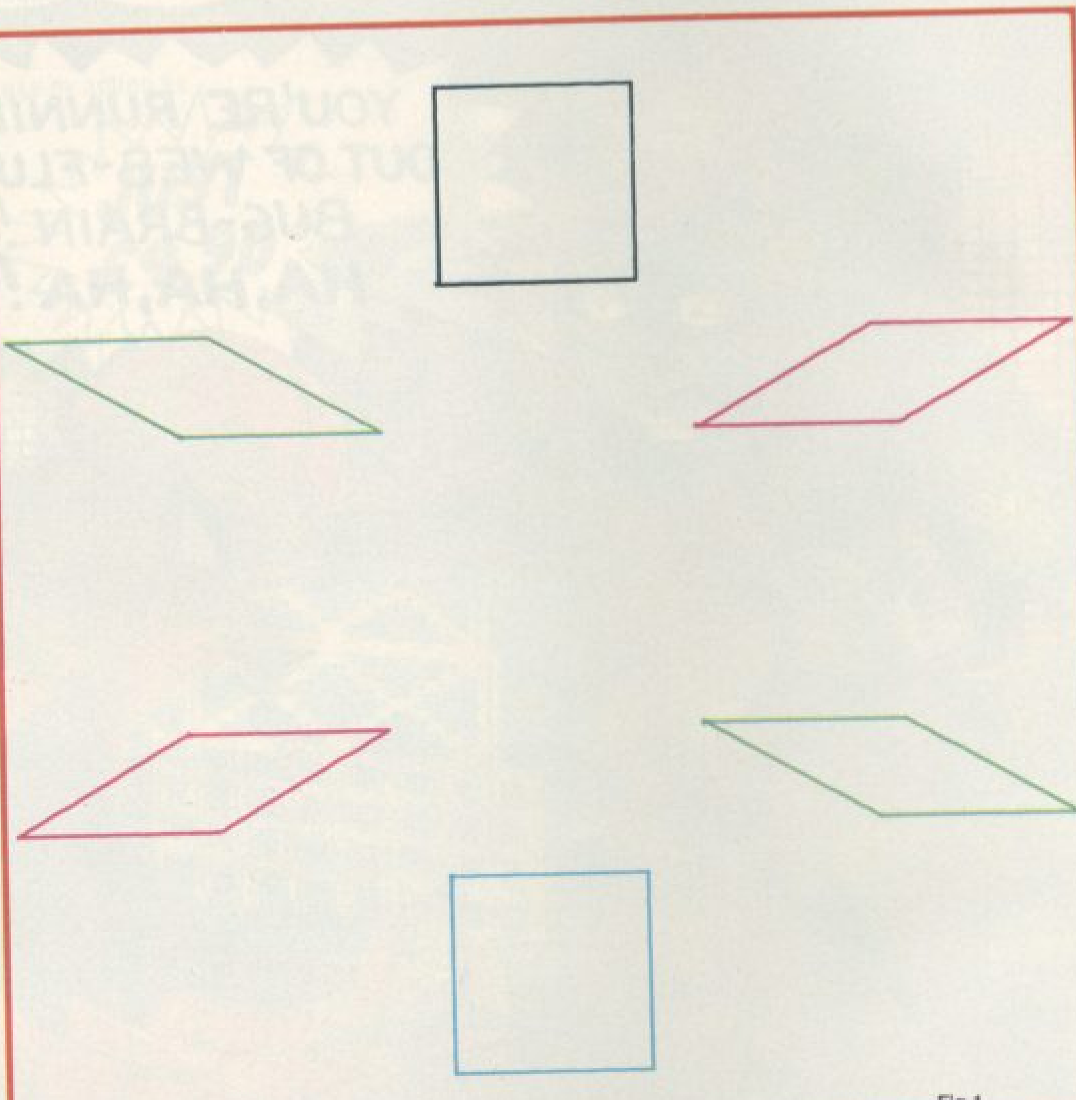


Fig 1.

If the way that the time is involved in the equations giving the patterns of movement is periodic, then the resulting pattern of movement will also be periodic.

In other words, the shape will return to its original position after a period of time. It will then repeat its previous cycle of movement again.

This is illustrated in figure 2, which was produced by using the rules

XC=XI + YI*SIN(T)
YC=YI*COS(T)

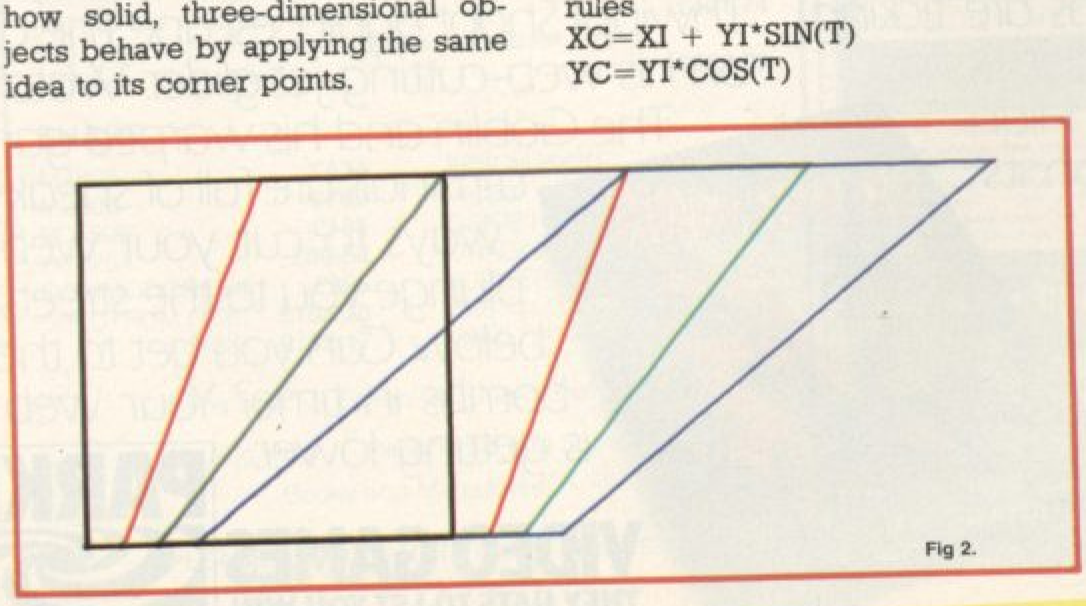


Fig 2.

The following program produces the initial shape of a square and three of its successive positions using the rules for movement given above.

```
10 DIM XI (4), YI (4)
20 FOR I=1 TO 4
30 READ XI (I), YI(I)
40 DATA 1, 1, 1, 5, 5, 5, 5, 1
50 FOR I=1 TO 4
60 T=0.1*(I-1)
70 XX=XI (1) + T*YI(1)
80 YY=YI(1)
90 MOVE XX, YY
100 FOR J=2 TO 4
110 X=XI (J)+T*YI(J)
120 Y=YI(J)
130 DRAW X, Y
140 NEXT J
150 DRAW XX, YY
160 NEXT I
```

The resulting shapes are shown in figure 1.

By Gary Marshall

* SUPER QUALITY SOFTWARE FROM LLAMASOFT!! *

(DESIGNER — JEFF MINTER)

J = JOYSTICK CONTROL

VIC 20

ABDUCTOR NEW J

A classic new space game! ZAP the swirling alien hordes before they ram you — and abduct your humanoids! Survive the assault for long enough and you'll get an extra stage on your spaceship with double firepower! Awesome unexpanded Vic Action. **£6.00 + 50p P&P.**

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Finally, true arcade quality on the unexpanded VIC! Shoot down the segmented DROIDS invading the grid. Beware of the pods and zappers! The awsome speed, sound and graphics gives you the best blast available for unexpanded Vic. **£6.00 + 50p P&P.**

ANDES ATTACK (8K) NEW J

Your spacecraft must attack the descending aliens and frustrate their evil intent. Fly your Ramjet fighter over the Andes mountain range and protect your llamas from kidnap by hostile UFOS. Features 5 kinds of UFO, controls include up, down, reverse, fire, thrust and smart bomb. Entirely in machine code. Requires 8K expansion and joystick. **£8.00 + 50p P&P.**

TRAXX M/C (8K + EXPANSION) J

This is VIC 20 cross breed between the now famed 'Packman' and the game 'Quix'. All in màchine code, fast and fun with joystick controls, uses Hi-Res colour graphics. 8K or larger expansion needed. **Only £6.00 + 50p P&P complete with instructions.**

BLITZKRIEG

As seen at the Commodore show and reviewed by the Daily Telegraph. Fly your Vulcan Bomber over the enemy city and destroy the buildings. 25 levels of play, uses Hi-Res colour graphics and plays Rule Britannia between waves. **Only £4.95 complete with instructions.**

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Planet earth needs you! Hostile aliens have used genetic engineering to mutate camels from normally harmless beasts into 90 foot high, neutronium shielded, laser-spitting death camels!! Can you fly your tiny, manoeuvrable fighter over the mountainous landscape to weaken and destroy the camels before they invade the human stronghold! You must withstand withering laser fire and alien UFOs. Game action stretches over 10 screen lengths and features superb scrolling, scanner, 1/2 player actions and unbelievable animation! Play this game and you'll never be able to visit a zoo again without getting an itchy trigger finger! Awesome m/c action! **£8.50 + 50p P&P.**

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Rox is a challenging game involving the defence of your lunar base from a deadly meteor shower. Rox-64 includes amazing sprite graphics displays and spacy sound effects, and an awesome 'mothership' display if you win the game. Top 10 scores are tabled along with their names. This program shows just what can be achieved using only Commodore-64 basic. Study the listing and learn how to use sprites and sound on this outstanding machine. **£4.95 + 50p P&P.**

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The No. 1 best game for the Vic has been improved for your COMMODORE 64! Gridrunner is a smash hit in the USA. Now experience the lightning-fast challenge of the grid on the '64. Features 31 skill levels and excellent sound and graphics. Sore trigger finger *free* with every game! **£8.50 + 50p P&P.**

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Not just another character editor! Allows you to define not only the 21 user definable characters. Also allows you to change the entire 96 character ASCII set. Creates BYTES files ready for you to load into your own programs. Includes advanced Reflect, Invert, Field commands etc. Complete with full documentation. Bin the BIN statement and use Graphics Creator with its easy on-screen cursor editing. **£2.95 + 50p P&P.**

BOMBER (16K)

Yes, a full feature version of the popular game 'Blitz', supplied for the 16K or 48K Spectrum. **For only £2.95 + 50p P&P.**

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Colourful new game starring Chico the headbanger who you must guide to riches through an increasing shower of heavy metal. Gain bonuses for headbanging but be sure to take an aspirin when the pain gets too much! Basic + m/c to speed up action. Great graphics, nice animation. Will even drive William Stuart system's voice synthesiser to produce speech output. Can you attain the grade of 'Rocker Class One' or will you be "Barry Manilow Class 5"? Start headbanging to-day and find out. **£4.95 NEW.**

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Bounce 'Sid', the space invader, around the screen into the power pods, keeping away of course from the devil who chases you around the screen. Steer with your Deflex shields, but beware the mines or you may be buried alive! Superb graphics and fantastic sound on the 48K Spectrum only. **Only £4.95 on cassette + 50p P&P.**

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ZX81

CENTIPEDE (16K)

the ORIGINAL game from the ORIGINAL author. This is the identical program to that being sold by other companies for three times our price. The game has received ecstatic reviews in the computing press. Program has 30 speed levels and ever increasing Centipede hordes. Tables top 10 scores and names. Why wait to pay more? **Only £1.95 + 50p P&P.**

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BEWARE THE LOST NUMBERS

BY KEITH CAMPBELL

I have already explained how to avoid renumbering your Adventure programs beyond recognition.

However, when your game is complete it will be desirable to renumber it, as it will look more professional.

Adventures have a particularly high number of GOTO and GOSUB statements. It is almost impossible to prove that all of these point to lines that exist. The chances are that you will have forgotten to write one of them!

A side benefit of renumbering the program is that this will identify any Undefined Line errors without the need for exhaustive playing. The utility, when run, will list the lines that ought to be there but have gone missing.

Depending upon the Basic your machine runs, renumbering may also save some memory assuming you convert to smaller numbers.

This will not be achieved by the line numbers themselves being smaller, since these will always use 2 bytes each, however small.

The saving comes when the Basic holds GOTO and GOSUB numbers in ASCII form, thus using 1 byte for each digit.

Therefore, the smaller the numbers of the pointers, the less memory will be used.

Having decided, then, to renumber your program, when is the best time to do it? This will depend on what renumber facility you have.

Some machines, for example the BBC, have the feature built in, as will most disc operating systems.

On the other hand, machines like the TRS-80 require that a special program be pre-loaded before the Basic program which is to be renumbered.

If your machine is this type, you will have to take into account the memory requirement for the utility, and ensure that your ever-growing Adventure is not too big before you renumber it!

If it is not quite finished, then perhaps it will be best to renumber in two's to leave space for insertions, otherwise renumber in one's.

If you are getting very short on memory, you might find that you can load both programs as long as you don't try to run the Basic program — the renumber utility will probably not take up much more room than the space the Adventure requires to run in.

Finally, if you have followed my convention for numbering REMarks, delete these before renumbering.

Apart from giving you the extra space you might need, the REMarks will have lost their identifying last digit of 9 after renumbering, and will be more difficult to locate.

We're falling in love again . . .

The other evening i found myself in a green bedroom wearing pyjamas and carrying a handbag.

Feeling somewhat weary I decided to have a short snooze, so I undressed and hopped into bed. Imagine my embarrassment when, stark naked, I suddenly awoke in a crowded room where a party was in progress!

All the guests turned and stared at me, and I froze to the spot. Regaining my senses, I returned with all haste to the bedroom, had a good wash, and feeling much better, put on the lovely silk dress I'd found in a trunk in the corner.

There was no doubt that I looked fantastic in it. Good, I thought, putting on some make-up, Tom should find me quite seductive.

Before you jump to any conclusions, let me explain that I was sitting in front of a computer, playing Love, an Adventure for women.

The action takes place in Poke Hall, and the object is to fall in love with a character called Tom. This Adventure runs on a ZX81 with 16K Rampack.

I played it in a mixed group with Barbara, Steve and Peter, who provided the computer. I soon got the impression I was already in love with Tom, as I found his cigarette lighter in my handbag.

Perhaps I ought to seduce him? Well, I obviously lacked a woman's intuition, because I couldn't even find Tom.

Meanwhile, Barbara was busily suggesting what clothes to wear and how to apply lipstick.

Steve and I were by now getting a trifle bored, and thinking up some fairly direct suggestions, which, being gentlemen, we refrained from mentioning in mixed company.

The game is certainly very suggestive, but Peter took the tape home to examine the listing and assured me that there were no naughty words in the program.

On the whole, Barbara felt that Love would be great fun played by a group of women. Personally, I would prefer to eavesdrop on those women than to actually play the game, but then it is advertised as an Adventure for women.

Strange, isn't it, that in these days of sexual equality, there are games especially for women, but not for men? Does this mean that all games not billed as 'for women' are suitable only for men?

Love is available from Remsoft of George Street, Brighton.



WARPATH

Part three of Ron Potkin's wild west wargame series tells you how to set up the board. Although it is designed for a TRS-80, we hope there is sufficient detail to help you succeed in adding Warpath to your collection.

Welcome back to the Wild West where you'll experience excitement and adventure on the Warpath!

Here we continue to set out the rules for this thrilling conflict between Indians and the cavalry.

Once the Board has been prepared, you will be asked if you wish to review the Map. If you reply "Yes", the map will scroll across the screen until you press "ENTER".

Details of the numbers of each type of piece will appear at the top of the screen. The middle of the northern portion of the map will appear (the Troopers always move first) and play may commence.

The order of Play.

a) The Troopers and the General move first. The player may move all, some or none of the men.

b) All conflicts resulting from that movement are resolved.

c) The Indians now repeat steps (a) and (b).

d) These steps continue throughout the game until one of the winning conditions is met. This may occur during either the movement or the combat phase.

AS promised, we will now discuss two important arrays: PTABLE and TBOARD. Once we have completed these, we can prepare the map and set-up the pieces ready for play to start.

PTABLE is an array of 50 by 3 and is dimensioned in line 780 as P(50,2). It contains information on each man i.e.

Index 0: The position on the Board.

Index 1: Type of piece — trooper, bowman etc.

Index 2: Attack flag.

Index 0 will be set to zero when the man is eliminated. If a piece is in a temporary HOLD condition, it is negated.

INBOARD is shown in figure 1. It is an array of 39 rows and 24 columns and is a representation of the map surrounded by a 4-byte border.

This requires 936 "cells" and, if dimensioned in integer format, would need at least 1872 bytes (more if your computer does not have the DEFINI instruction).

This wastes memory since no cell will hold a number greater than 255. Instead, I have reserved an area of 936 bytes starting at location 31669 (see line 1100). Since it is not a dimensioned array the only way I can access it is by PEEK and POKE.

When first initialised the centre is filled with 128's and the border with 99's. Each byte whose equivalent position on the map is occupied by a peice is given the value of the index of that piece (i.e. from 1 to 50). Those occupied by the garrison or boulders are given the value of 60.

The border is a useful feature. In the original KRIEGSPIEL, I carried out the calculations necessary to ensure that a piece was not attempting to move off the map, but this added to the time required to make a move.

With a border, one need only check if the piece is stepping on to a 99, If he is then the move is illegal.

Now we need another algorithm which relates IBOARD to BIGSCREEN. Given BL, the location of the piece on IBOARD, it returns ML, the location on BIGSCREEN. This subroutine is in line 320. It also returns V3 which is the location of the piece in memory.

I think you will be able to see that since IBOARD is 24 columns wide and the first location is at 100, the variable Q is the row number. If you look at BIGSCREEN, you will see that odd numbered rows are offset by 4; hence the need for "Q and 1".

Provided the argument is less than 32768, this faster and neater than "Q-2xINT (Q / 2)". If X, the divisor, is a power of 2 the remainder can always be obtained by NUMBER AND (X - 1).

Now that all four arrays are defined, we can review how they all fit togehter:

● The whole game is controlled by PTABLE which we run through sequentially; troopers first followed by the Indians.

● Read index 0 from PTABLE and obtain the location of that piece on IBOARD. If the location is zero, the piece has been eliminated — go to the next piece.

● Obtain the type of piece from index 1, get the correct character from the H table and calculate the number of moves for the piece (variable MV).

● Use BL to calculate ML from line 320. The machine language routine in X$(1) is now used to calculate the rectangle to be selected from BIGSCREEN.

● Display the rectangle and prompt the player for his move. We do this by alternately printing both the character and the number of moves at the position SP so that the piece flickers.

● Assume the player wants to move the piece and presses a number key. The hex he wants to move to (variable NX) is calculated and a check is made

LAYOUT OF THE INTERNAL BOARD

Game is played in the area bounded by the four corners 100,115,820 & 835
It is initially filled with 128's
The outer margin is filled with 99's

0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
2	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
3	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
4	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
5	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
6	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167
7	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
8	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215
9	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
10	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263
11	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
12	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311
13	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335
14	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359
15	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383
16	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407
17	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431
18	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455
19	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
20	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503
21	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527
22	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551
23	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575
24	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599
25	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623
26	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647
27	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671
28	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	495
29	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719
30	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743
31	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767
32	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791
33	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815
34	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839
35	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863
36	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887
37	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911
38	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935



on IBOARD to see if the hex is empty. If it is not, the program returns to the prompt.

- If the move is legal several things happen:
  - a) Print a CHR$(128) — a space — on the screen at the old location.
  - b) Print the character at the new location.
  - c) Put 128 into position V3 on the IBOARD.
  - d) Put the piece index into NX.
  - e) Put the new location NX into index 0 in PTABLE.
  - f) Transfer WINDOW back to BIGSCREEN.

The listing this month will put the men, boulders and garrison on the map. As usual, load the Basic program containing both BIGSCREEN and PIECES from the last two months. Type in the listing below. We can now delete lines 821 and 2499 to 2610 — we no longer need the DEMONSTRATION DRIVER.

Save the program before you run it. By the way: I hope you are keeping the "UNRUN" versions. If you have only saved the RUN versions, the program will still work but you will have to avoid editing the lines from 1540 to 1560.

When you are asked for the scenario number, enter any number up to 9999. Type a number up to about 30 when asked to enter the number of boulders.

Next month, we are going to describe the SEARCH routine which will give you the chance to study some more Z80 machine language.

- If you are having difficulties entering Warpath into your type of computer please write in and let us know. We'll be interested to find out what your problems are and help tailor the write-up to offer advice on any computer which seems to be giving particularly difficult commands to translate.

WARPATH Part 3 — SET UP

```
130 SV(K)=SV(K)+1:PC(I,0)=BL:PC(I,1)=K:GOSUB380:PRINT@SP,H(K);:G
OSUB140:POKEV3,I:GOSUB370:I=I+1:RETURN
140 IFK<>5THENRETURNELSESF=BL:A1=CHR$(171):PRINT@SP+3,A1;:RETURN
320 Q=INT((BL-100)/24):ML=8*BL-800-64*Q+4*(QAND1):V3=BD+BL:RETUR
N
370 O=0:GOTO390
380 O=1:GOSUB320
400 O=0:GOTO420
410 O=1:GOSUB320
420 P=B1:GOSUB190:SP=USR(ML+O):P=B4:GOSUB190:RETURN
540 RETURN      'STUB
830 CLS:INPUT"REVIEW MAP";A:IFLEFT$(A,1)="Y"THENGOSUB850
840 GOSUB540:GOTO840
850 CLS:FORI=220TO700STEP96:FORJ=0TO15:BL=I+J:GOSUB410:IFINKEY$<
>""THENRETURNELSENEXT:NEXT:GOTO850
860 P=B1:GOSUB190:K=1:I=1:R3=2
870 READJ:IFJ>0THENFORJL=JTOJ+504STEP72:GOSUB260:BL=JL-1+WN:GOSU
B130:NEXT:K=K+1:GOTO870ELSEI=26:K=4
880 READBL:IFBL>0THENGOSUB130:GOTO880ELSEIFBL=-1THENK=K+1:GOTO88
0
890 BL=797:GOSUB380:FORJ=0TO2:PRINT@388+J*8,CHR$(128)+CHR$(188)+
CHR$(188);:POKEBD+676+J,60:NEXTJ:PRINT@452,GT;:A=CHR$(191):PRINT
@542,A;:PRINT@606,A;:PRINT@664,STRING$(6,176);A;:PRINT@728,A;:PR
INT@788,C5;A;:POKE822+BD,60:GOSUB370
900 READJ:IFJ>=0THENPOKEBD+J,60:GOTO900
910 IFMT<=0THENRETURNELSER3=495:FORI=1TOMT
920 GOSUB260:BL=100+WN+8*INT(WN/16):IF(BL=629)OR(BL=630)OR(BL>79
5)OR(BL=653)THEN920ELSEGOSUB320:IFPEEK(V3)<>ZTHEN920
930 O=1:GOSUB390:POKEV3,60:PRINT@SP,C3;
940 GOSUB370:GOSUB430:PRINTMT;I;:NEXTI:P=B4:GOTO190
1084 GOSUB5200
1085 RESTORE
1086 READM:IFM<>-128THEN1086
1190 DATA102,100,138,-1
1200 DATA206,203,205,204,178,182,179,181,155,158,130,134,108,109
,725,726,749,748,750,773,774,772,724,-1
1210 DATA132,-2
1220 DATA700,702,727,775,798,-1
```

WARPATH

to be continued next month

Illustration: Jon Davis

Make Friday your



Friday, March 11th sees the launch of Britain's most exciting microcomputing publication. Big deal.

You've heard all that before, eh? Over the last year, everybody and the cat's mother have been launching microcomputer publications.

And most of them cost the better part of a quid.

And the really good ones are rarer than hen's teeth.

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PUZZLING

A MIX-UP IS ON THE CARDS

Each of five boys wrote one of the words SURLY, THUMB, UNDER, VIXEN, WHACK on a card. Then each took a card one of the others had written.

Bob wrote the word taken by Charlie; Al took the word written by the boy who took the word SURLY; Dan wrote the word taken by the boy who wrote the word VIXEN; Ed wrote the word taken by the boy who wrote the word taken by Ed himself.

In no case did the word a boy wrote and the word he took begin with consecutive letters.

Now, if you've managed to follow all that, breathe in, don't panic, count to 10 and tell us the word written by Bob and the word on the card taken by Dan.

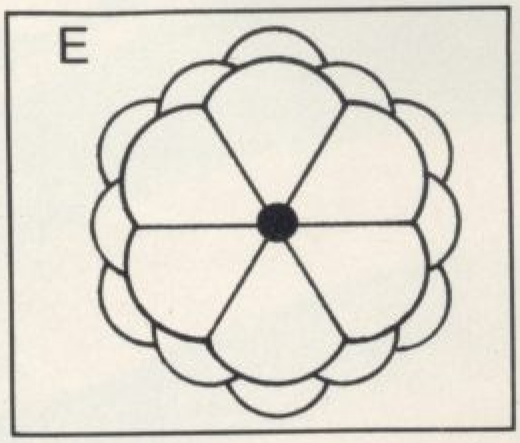
Paul McClenon

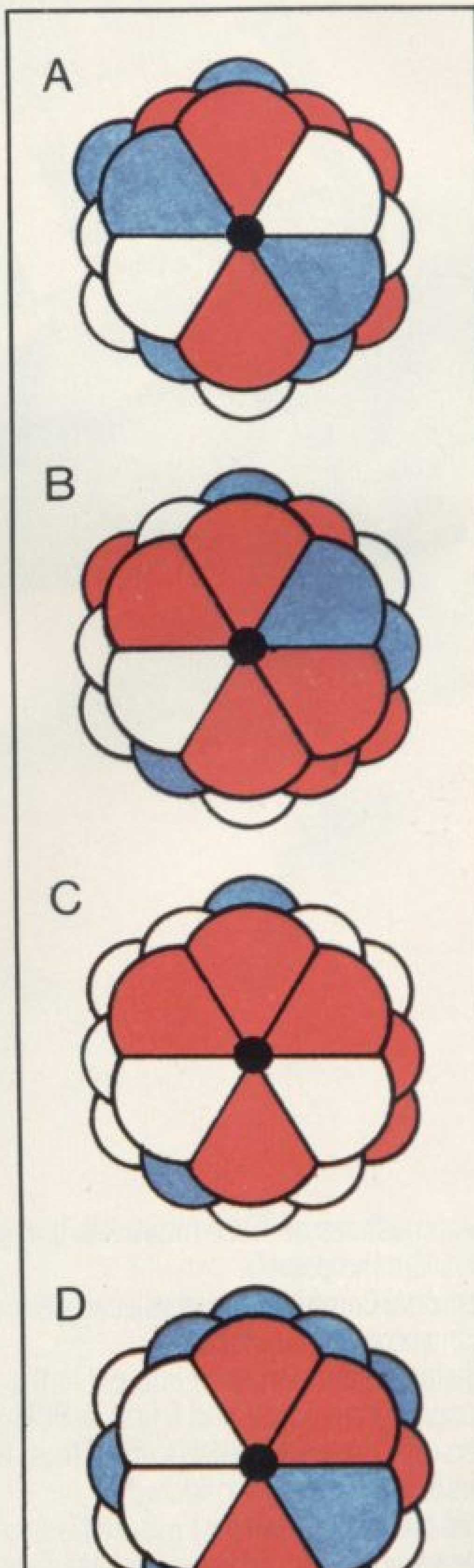
A BLOOMING PROBLEM

Farmer Nure has spent the last four years developing his unique plant, *rosa patriotica,* for show.

Nature, after following a strictly logical path in selecting each petal's colour in successive blooms, then threw in an unseasonal frost and killed the fifth generation before it blossomed (see [E] below).

Can you work out how it would have been coloured?

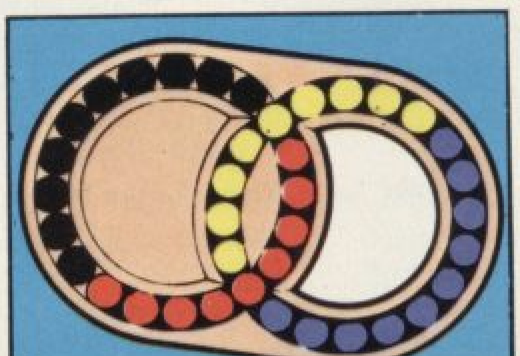




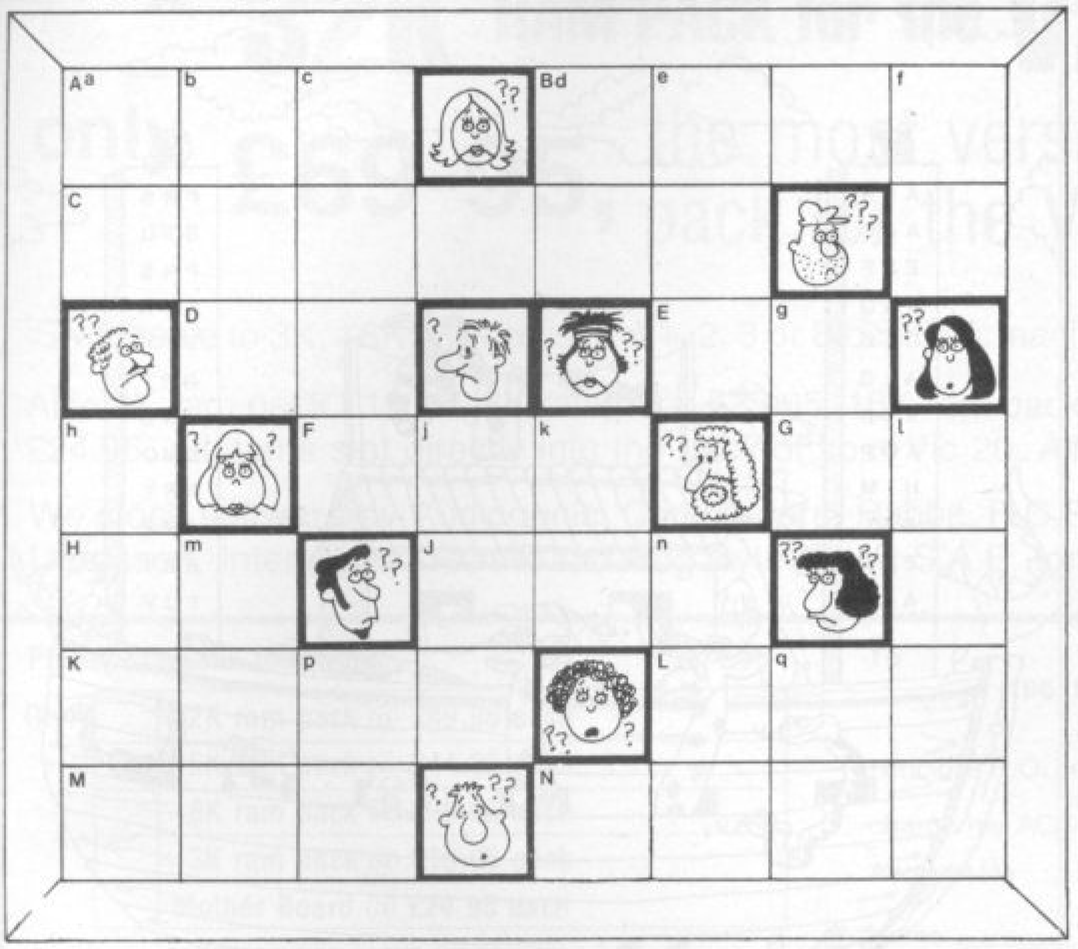
We are giving away 10 Hungarian Rings to 10 Puzzling fanatics who can solve Farmer Nure's blooming problem before March 12th.

Vulcan Electronics have put forward 10 of their brain-teasing ring puzzles (pictured below) for the first 10 solutions out of the hat. Once jumbled up they may never be solved again.

Just colour in the "E" bloom above and send it to: A Blooming Problem, Computer & Video Games, 8 Herbal Hill, London EC1R 5JB.



PUZZLING



FACING UP TO A CROSSNUMBER

Just in case this is new to any of you present here today — the puzzle is similar to the crossword in that one digit is entered in each square instead of one letter and numbers are formed Across and Down instead of words.

The main differences are that in crossnumbers the clues can be much more inter-related and initially perplexing (B across — see g down; g down — see B across!) and, in this particular version, some of the clues are so deliberately vague as to require a calculator or short computer program to search for the one answer among several possibilities.

So, with one hand on the keyboard and t'other round the pencil, here we go . . .

Clues: Capital letter refer to Across clues, lower case to Down clues.

ACROSS

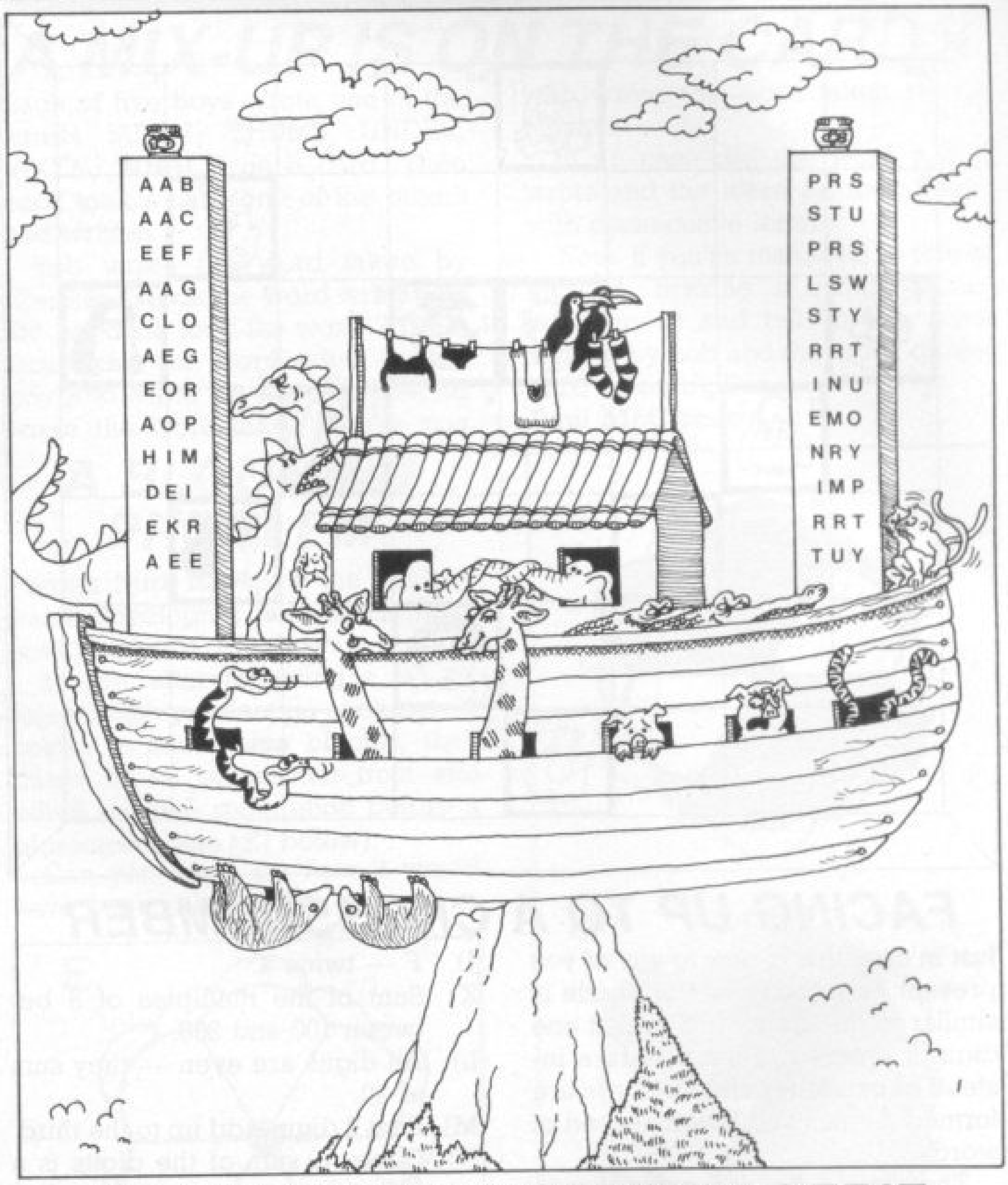
A) The square of the last 2 digits of C.
B) Prime cubed — the digits sum to the original prime.
C) Prime cubed — all its digits are odd.
D) Ↄ !!
E) Factor of e.
F) Fibonacci number which has consecutive digits.
G) Multiple of 7.
H) Digits add up to 16.
J) F — twice a.
K) Sum of the multiples of 3 between 100 and 200.
L) All digits are even — they sum to 20.
M) First 2 digits add up to the third.
N) Cube — sum of the digits is a cube.

DOWN

a) Prime — see h.
b) Difference between the sum of the first ten squares and the first 10 primes (no, 1 is not a prime).
c) All odd digits which sum to 18.
d) Reversed, would be twice the square root of g.
e) See E.
f) See q.
g) See q.
h) Sum of several consecutive multiples of a, starting from 507.
j) Difference between the first 2 digits is one more than the last digit.
k) Multiple of G reversed.
l) Square — split in half gives two more squares.
m) Cube squared plus a square cubed.
n) Sum of the first 10 Fibonacci Numbers (1,1,2,3,5, . . .).
p) Another Fibonacci Number.
q) f+g.

The solutions to the Puzzling brainteasers can be found on page 11.

PUZZLING



NOAH'S MUDDLED MENAGERIE

Just how Noah managed to land the Ark on Ararat is glossed over in all the literature. It can now be placed on record that he landed with a bump like that of a hanglider whose wing has prematurely folded.

The result was to turn his *menagerie* into a *macedoine* — his ZOO became, literally, an OOZ.

Twelve of the six-letter specimens had their letters re-arranged into alphabetical order and split in half. The two lists were then sploshed around in rather random fashion.

Before Noah could lower the gangplank he had to match the correct parts and so order the letters that our familiar names re-appear, otherwise the world would be stuck with a HHRSTU instead of a THRUSH!

The whole of creation was at stake and if he didn't sort things out right now, the evolutionists would have a field day in the future.

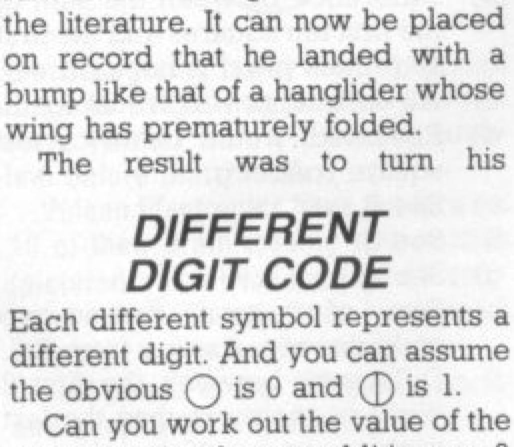
So he set to and did his best to give the world back a batch of animals it might be able to pronounce.

Can you give him a hand and tell him which 12 animals can be unloaded.

DIFFERENT DIGIT CODE

Each different symbol represents a different digit. And you can assume the obvious ◯ is 0 and ⦶ is 1.

Can you work out the value of the others to complete an addition sum?



BY TREVOR TRURAN

C & VG SOFTWARE FORM

Have you written a games program which you feel is just right for C&VG? If so we have come up with a form to ensure that we can test it out and give you our views on it, as quickly as possible.

We would prefer a tape and listing but can work from just a tape and will return it to you if it doesn't find its way into the magazine. We will also need an additional sheet explaining the game and its theme. And any documentation like lists of variables or how certain routines are working, would be of great help to beginners.

This form will merely help us to keep a check on your game as it goes through our testing process and make sure we have all the information we need to present it properly in the magazine.

If you don't want to cut up the magazine, we will accept photocopies or close copies of this page. This form will be appearing regularly in C&VG issues from now on.

Remember we pay £10 for each listing published and you could win our Programmer of the Year Contest where we will try to turn the winner into a best-selling games author.

Program name: ....

Machine make: .... Model ....

Other models it should run on: .... Number of K needed to run it: ....

Other equipment (joysticks, Extended Basic, add ons, etc.) needed to run it: ....

Author's Christian name: .... Surname: ....

Address: ....

....

.... Tel: .... Date: ....

Type of game: (If original please say so) ....

Loading instructions: ....

Game instructions: (If not included in the listing) ....

....

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Evaluator's comments

Good enough to publish ☐

Needs some tidying up ☐

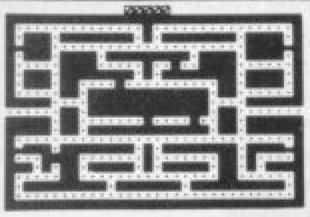
Not worth publishing ☐

Same game already published on this micro ☐

Wouldn't load ☐

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MACHINE CODE

DECISION MAKING AND THE MICRO

The real power of computers comes from the way they can make decisions and perform different actions according to different values of the input data.

We will now start to look at the "decision making" instructions in assembly language.

In Basic we have instructions of the form "IF condition THEN GOTO line number", where the condition may be a complicated expression involving arithmetic, logical and comparison operators.

In assembly language, however, the only conditions we can use directly involve the sign, zero, carry and overflow flags.

The first type of conditional jump we are going to look at is the Branch or Relative Jump, and the instructions available on the 6502, 6809 and Z80 are listed in tables 1, 2 and 3.

The only conditional jumps on the 6502 are the eight branch instructions shown in table 1, but the 6809 and Z80 have others which we will deal with later.

In Basic we have to use line numbers to refer to the program instructions. In assembly language we use labels instead of line numbers.

The editing programs in some assemblers use line numbers but this is purely to keep the lines in the right order and it is impossible to refer to the line numbers in the assembly language program.

The standards for 6502, 6809 and Z80 assembly languages specify that labels may be up to six characters long, the first character must be alphabetic, and any subsequent characters may be alphabetic or numeric.

Thus, START, FINISH, L99, A2B3, are valid labels but ?START, 9L, are invalid.

Also, register names, opcode mnemonics and other reserved words are usually not allowed as labels, but even when your assembler allows reserved words to be used as labels it is not good practice to use them.

Some Z80 assemblers require that a label must be followed by a colon. In this case it may be possible to use a reserved word as a label because the colon permits the assembler to distinguish between.

For example, ADD: used as a label and ADD used as an opcode mnemonic.

To see how we use labels with the branch or relative jump instructions, let us look at simple counting loops in the three assembly languages.

table 1

	Hex Object Code	Label	Instruction
6502			
	A2 0A	START	LDX #10
	CA	LOOP	DEX
	D0 FD		BNE LOOP
6809			
	86 10	START	LDA #10
	4A	LOOP	DECA
	26 FD		BNE LOOP
Z80			
	06 10	START	LD B,10
	05	LOOP	DEC B
	20 FD		JR NZ, LOOP

We start by setting a register to the initial value of the count, then decrement the counter register. If the register is not zero we jump back to the decrement instruction labelled LOOP.

When the counter register becomes zero, after 10 steps, the program will continue with the next instruction.

The branch or relative jump instruction introduces a new addressing mode, *relative addressing*.

The second byte of the object code is a displacement specifying how many bytes to jump; regardless of the absolute address of the instruction the jump will be to the address a specified number of bytes away.

The displacement is a signed binary number, with values from 0 to 7F hex (o to 127 decimal) representing a forward jump and values from 80 to FF hex (128 to 255 decimal) representing a backward jump.

The absolute address, which is the destination of the relative jump, is calculated by taking the absolute address of the byte immediately following the relative jump instruction and adding the displacement, making allowance for the sign.

In the examples above, if the first line began at address 1000 hex the second line would begin at 1002 hex, the third line would begin at 1003 hex and the address of the byte following the relative jump instruction would be 1005 hex.

The value of FD hex for the displacement, interpreted as a signed number, is equivalent to −3, so the destination address is 1005 + (−3), or 1002.

To illustrate a forward relative jump consider the following examples:

	Address	Hex Object Code	Label	Instruction
6502	1050	90 2E		BCC DEST
	1052	. . .		. . .
	. . .	. . .		. . .
	1080	. . .	DEST	. . .
6809				
	1050	24 2E		BCC DEST
	1052	. . .		. . .
	. . .	. . .		. . .
	1080	. . .	DEST	. . .
Z80				
	1050	30 2E		JR NC,DEST
	1052	. . .		. . .
	. . .	. . .		. . .
	1080	. . .		. . .

The destination, 1080hex, is calculated by adding the displacement, 2E hex, to the address of the byte following the relative jump instruction, 1052 hex, or conversely the displacement is calculated by subtracting 1052 hex from 1080 hex.

WITH A HOP, A SKIP AND JUMP!

As well as these relative jumps we have absolute jumps, where the destination address is included in the instruction.

The Z80 instruction set includes conditional absolute jumps, which are shown in table 4. On the 6502 and 6809 relative addressing is used for all con-



BY TED BALL

ditional jumps, and in other addressing modes we have only the unconditional jump, with opcode mnemonic JMP.

In assembly language we can write a label or a numeric value for the destination address, for example:

```
6502 & 6809
          JMP $1000
          JMP START
Z80
          JP 1000H
          JP NZ,START
```

The object code format for the unconditional jump instructions is one byte for the opcode followed by two bytes for the operand.

The operand appears in the usual format for a two byte operand, with the low byte first and the high byte second on the 6502 and Z80, and with the high byte first and the low byte second on the 6809. Thus we would have:

	Hex Object Code	Source Code
6502	4C 00 10	JMP $1000
Z80	C3 00 10	JP 1000H
6809	BD 10 00	JMP $1000



FLAGS SIGNAL THE MESSAGE

In order to use the conditional jumps we need to know how the other instructions affect the flags. It is not difficult to learn which flags are affected by various classes of instruction, but you will need to look this up in a reference manual at first.

In most cases we only need to bother with the sign, zero and carry flags and it is usually quite easy to work out how these flags are affected by most instructions.

However, there are complications when signed arithmetic is involved, and next month we will look more losely at the mechanics of signed binary arithmetic, paying special attention to the values of the carry and overflow flags in the various cases that can arise.

Table 1
6502 Branch Instructions

Hex Code	Instruction	Meaning
10	BPL label	Branch if plus (positive)
30	BMI label	Branch if minus (negative)
50	BVC label	Branch if Overflow clear
70	BVS label	Branch if Overflow set
90	BCC label	Branch if Carry clear
BO	BCS label	Branch if Carry set
DO	BNE label	Branch if Not equal (Not Zero)
FO	BEQ label	Branch if Equal (Zero)

Table 2
6809 Branch Instructions

Hex Code	Instruction	Meaning
20	BRA label	Branch always
21	BRN label	Branch never
22	BHI label	Branch if higher (greater)
23	BLS label	Branch if lower or same
24*	BCC label	Branch if Carry clear
24*	BHS label	Branch if higher or same
25*	BCS label	Branch if Carry set
25*	BLO label	Branch if lower
26	BNE label	Branch if Not Equal (Not Zero)
27	BEQ label	Branch if Equal (Zero)
28	BVC label	Branch if Overflow clear
29	BVS label	Branch if Overflow set
2A	BPL label	Branch if Plus (positive)
2B	BMI label	Branch if Minus (negative)
2C	BGE label	Branch if Greater or Equal
2D	BLT label	Branch if Less Than Zero
2E	BGT label	Branch if Greater Than Zero
2F	BLE label	Branch if Less Than or Equal to Zero

*Note two different opcode mnemonics for the same object code.

Table 3
Z80 Relative Jumps

Hex Code	Instruction	Meaning
10	DJNZ label	Decrement B & Jump if Not Zero
18	JR label	Jump Relative
20	JR NZ, label	Jump Relative if Not Zero
28	JR Z, label	Jump Relative if Zero
30	JR NC, label	Jump Relative if No Carry
38	JR C, label	Jump Relative if Carry

Table 4
Z80 Absolute Jumps

Hex Code	Instruction	Meaning
C3	JP label	Jump
C2	JP NZ, label	Jump if Not Zero
CA	JP Z, label	Jump if Zero
D2	JP NC, label	Jump if No Carry
DA	JP C, label	Jump if Carry
E2	JP PO, label	Jump if Parity Odd/Overflow set
EA	JP PE, label	Jump if Parity Even/Overflow clear
F2	JP P, label	Jump if Sign Positive
FA	JP M, label	Jump if Sign Negative



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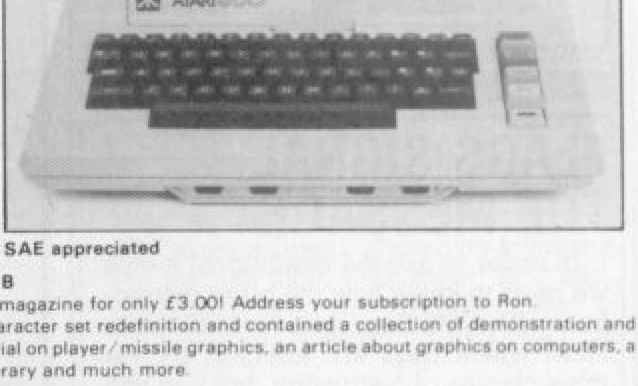
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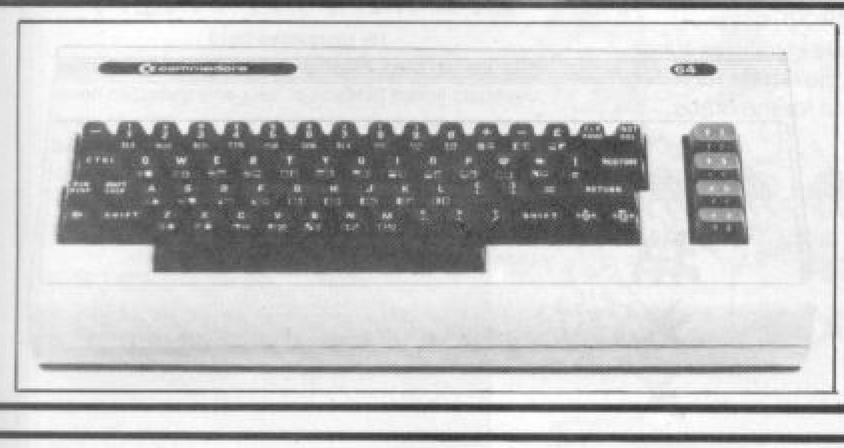
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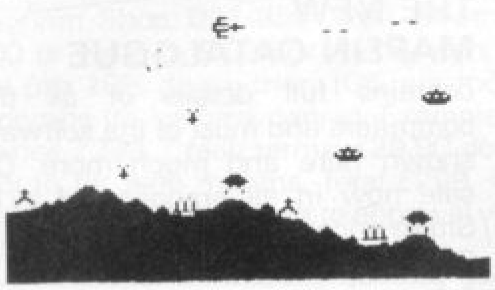
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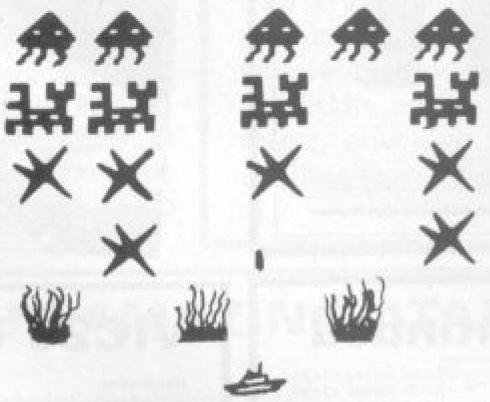
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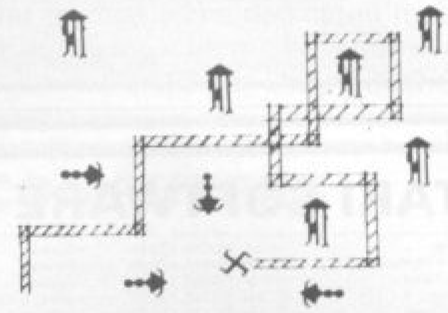
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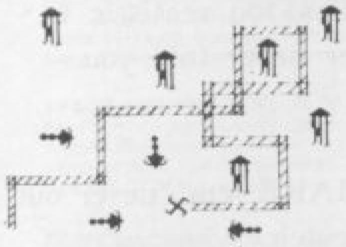
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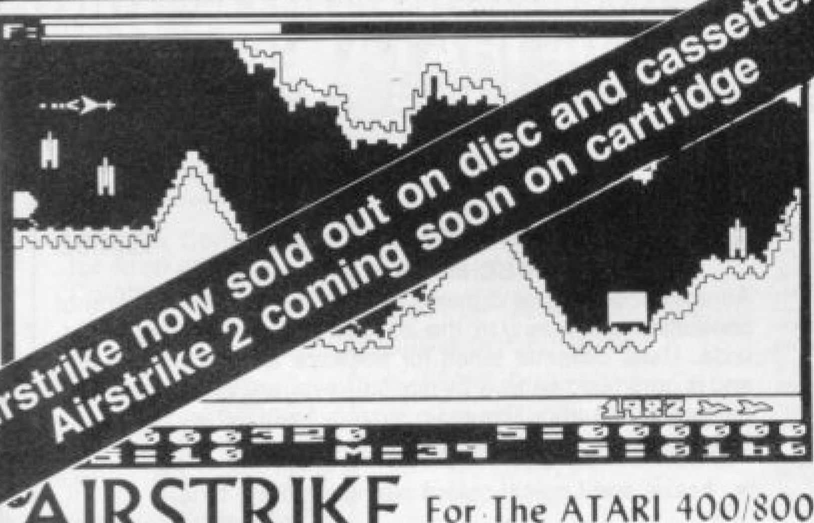
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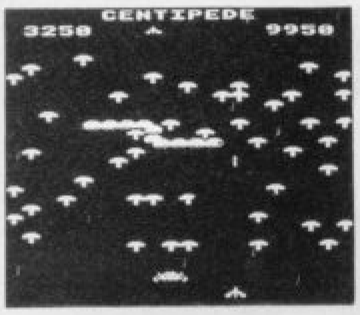
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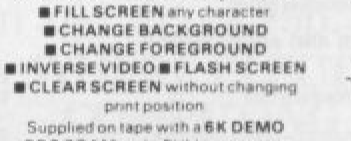
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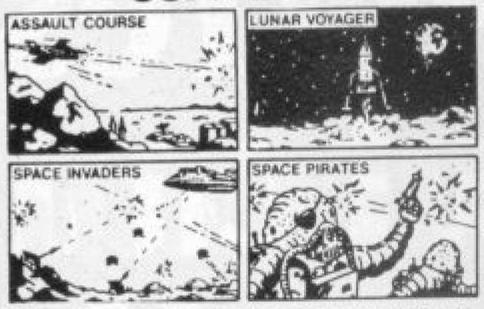
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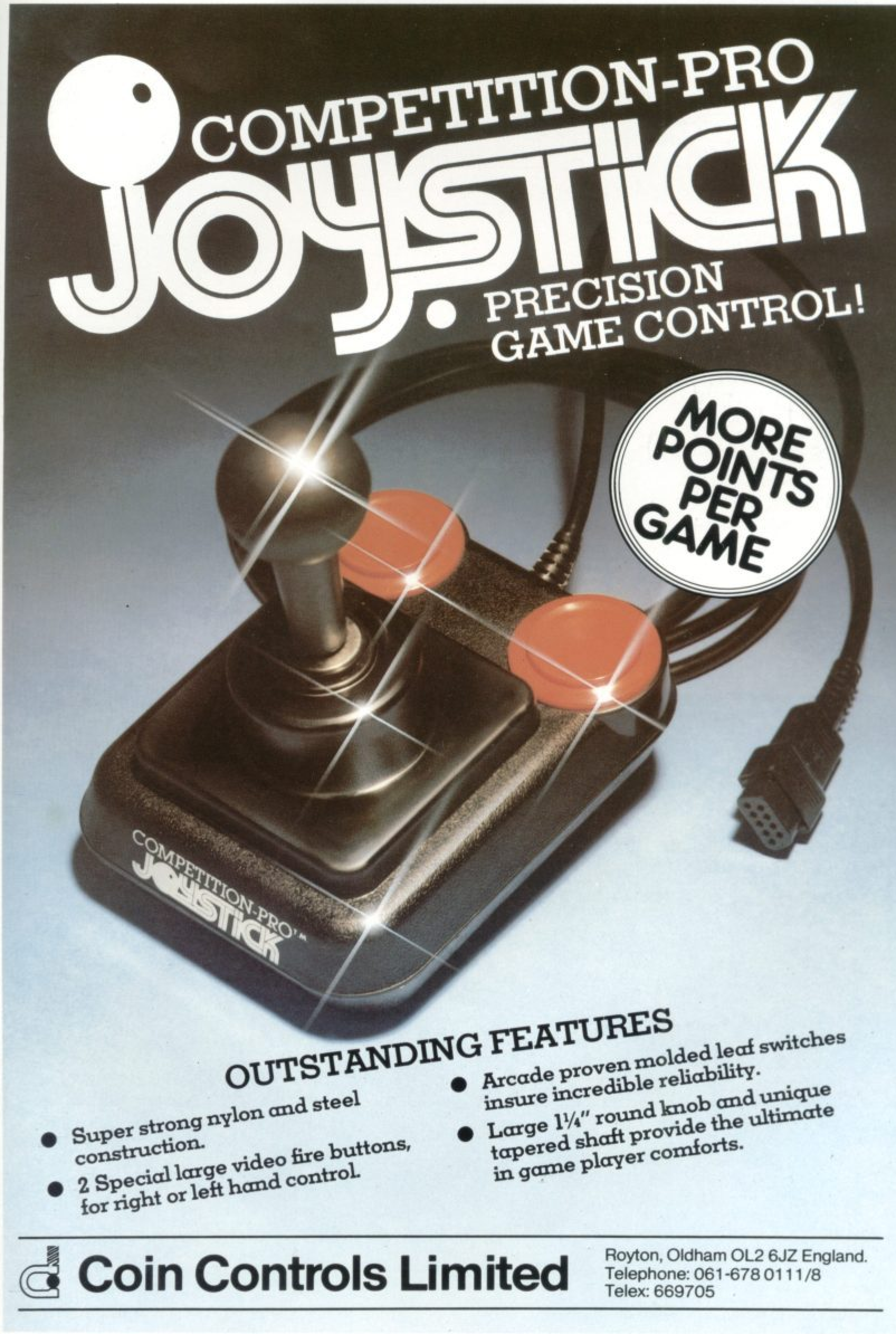
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